FR-320 Series

Pre-Action/Deluge and Agent Release Control Panel

Installation and Operation Manual

LT-951 Rev. 9.2
January 2014

Table of Contents

1.0 Industry Canada and FCC Notice 12

1.1 Notice for all FR-320 Series Built-In UDACTs Sold in Canada 12
1.1.1 Industry Canada Notice 12
1.1.2 Notice for all FR-320 Series Built-in UDACTs Sold in the U.S.A. 12
1.1.3 FCC Notice 12

2.0 Introduction 14

2.1 Panel Type 14
2.1.1 Deluge sprinkler system 14
2.1.2 Pre-action sprinkler system 14
2.1.3 Agent release system 14
2.2 Overall Features 14

3.0 Conventions 16

3.1 Circuits 16
3.2 Zone 16
3.3 Display Points 16
3.4 Wiring Styles 16

4.0 System Components 17

4.1 Main Pre-Action/Deluge and Agent Release Control Panel 17
4.2 Relay Modules: Six Relays 18
4.3 Polarity Reversal/City Tie 18
4.4 Smart Relay Module 18
4.5 Input Class A Converter: Six Circuits 18
4.6 Output Class A Converter: Two Circuits 19
4.7 RAM-216 Remote Annunciator 19
4.8 Active end-of-line 19
4.9 Additional System Accessories 19

5.0 Mechanical Installation 20

5.1 Installing the Enclosure 20
5.2 BBX-1024DS and BBX-1024DSR Mechanical Installation 21
5.3 Installing the Adder Modules 23

6.0 Cable and Jumper Connections for Main Board, Core Board and Adder Modules 24

6.1 Main Pre-Action/Deluge and Agent Release Control Board 24
6.1.1 Connectors and Jumpers on the Main Fire Alarm Board 25
6.1.2 Connectors and Jumpers on the Core Board 25
6.2 ICAC-306 Input Class-A Converter Adder Module 25
6.3 OCAC-302 Output Class-A Converter Adder Module 26
6.4 RM-306 Relay Adder Module 26
6.4.1 RM-306 Jumpers 26
6.4.2 RM-306 Correlations 27
6.5 Polarity Reversal and City Tie Module (Model PR-300) 27
6.5.1 PR-300 jumper settings 27

7.0 Field Wiring 28

7.1 Main Board Field Wiring 28
7.1.1 Initiating Circuit Wiring 28
7.2 Abort and Manual Release Switch Wiring 29
7.3 Indicating Circuit Wiring 31
7.3.1 Releasing Circuit Wiring 32
7.4 Dialer Wiring 32
7.5 Relay Adder Module Wiring 33
7.6 Polarity Reversal and City Tie Module (PR-300) Wiring 34
7.6.1 Power Supply Connection 35
7.7 Wiring Tables and Information 36
7.8 Four-Wire Smoke Power (regulated) 36
7.9 Supervised Auxiliary Power (regulated) 37
7.10 Unfiltered Supply (full wave rectified) 37

8.0 System Checkout 38

8.1 Before turning the power “ON” 38
8.2 Power-up procedure 38
8.3 Troubleshooting 39

9.0 Indicators, Controls and Operations 40

9.1 Common LED Indicators 41
9.1.1 AC On 41
9.1.2 Common Alarm 41
9.1.3 Common Trouble 41
9.1.4 Battery Trouble 41
9.1.5 Remote Trouble 41

9.1.6 Ground Fault 41
9.1.7 CPU Fail 41
9.1.8 Abort 41
9.1.9 Released 41
9.1.10 System Reset 41
9.1.11 Signal Silence 41
9.1.12 Auxiliary Disconnect 41
9.1.13 Lamp Test 41
9.1.14 Buzzer Silence 42
9.1.15 Pre Release 42
9.2 Menu Buttons 42
9.3 Switches and Common Indicators 42
9.3.1 Zone 1 to Zone 4 42
9.3.2 Zone 5 and Zone 6 42
9.3.3 Out1 and Out2 (NAC circuits) 43
9.3.4 Out3 and Out4 (Releasing circuits) 43
9.3.5 Input Circuits Bypass Switch 43
9.3.6 Output Circuits Bypass Switch 43
9.4 Common Controls 43
9.4.1 System Reset Button 43
9.4.2 Signal Silence Button 43
9.4.3 Auxiliary Disconnect Button 43
9.4.4 Lamp Test Button 44
9.4.5 Buzzer Silence Button 44
9.5 Circuit (zone) disconnect buttons 44
9.6 Common Relays 45
9.7 Circuit Types 45
9.7.1 Initiating (Detection) Circuit Types 45
9.7.2 Non-Verified Alarm 45
9.7.3 Water Flow Alarm (Water flow Sensors) 45
9.7.4 Non-Latching Supervisory (For Supervisory Circuits) 45
9.7.5 Latching Supervisory (For Supervisory Devices) 46
9.7.6 Abort Switch 46
9.7.7 Manual Release Switch 46
9.7.8 Combination of Abort Switch and Manual Release Switch 46
9.7.9 Indicating (Signal) Circuits Types 46
9.7.10 Silenceable Signal 46
9.7.11 Non-Silenceable Signal 46
9.7.12 Silenceable Strobe 46
9.7.13 Non-Silenceable Strobes 46
9.8 Evacuation codes 47

10.0 Configuration 48

10.1 Using the CFG-300 Tool 48

10.2 Entering the Passcode 48
10.3 How to Use the Keypad to Program the FR-320 49
10.4 Command Menu 50
10.5 1. Panel Config (Command-Menu) 51
10.5.1 Command Menu-->Panel Config-->Choose a mode 51
10.5.2 Command Menu-->Panel Config-->Hazard Config 52
10.6 2. Set Time (Command-Menu) 56
10.5.3 Command Menu-->Panel Config-->Default Config 56
10.7 4. View Event Log (Command-Menu) 58
10.8 5. Print Event Log 58
10.9 6. Clear Event Log (Command-Menu) 59
10.10 7. Dialer Config (Command-Menu) 59
10.10.1 Account Info 60
10.10.2 Telephone Line 62
10.10.3 Report Options 63
10.10.4 Time Parameters 64
10.10.5 Dialer Enable/Disable 65
10.11 8. Test Dialer (Command-Menu) 65
10.11.1 Dialer Test Messages 66
10.12 9. Exit (Command-Menu) 67

11.0 Operating the Panel 68

11.1 Panel Operation During Various Hazard States 68
11.1.1 Hazard Idle 68
11.1.2 Hazard Alert (or equivalently first Alarm in Cross-zoned Application) 68
11.1.3 Hazard Alarm (pre-discharge, or equivalently second Alarm in Cross-zoned Application) 68
11.1.4 Hazard Release 69
11.2 General Panel Operation 69

12.0 Pre-Programmed Modes 70

12.1 Mode 1: Agent Release, Single Hazard, Cross-zoned, Combined Release 70
12.1.1 Zone Configuration 70
12.1.2 Hazard Configuration 70
12.1.3 NAC Configuration 70
12.1.4 How the Panel Works in Mode 1 71
12.2 Mode 2: Agent Release, Single Hazard, Not Cross-zoned, Combined Release 72
12.2.1 Zone Configuration 72
12.2.2 Hazard Configuration 72
12.2.3 NAC Configuration 72
12.2.4 How the Panel Works in Mode 2 73
12.3 Mode 3: Agent Release, Dual Hazard, Cross-zoned, Split Release 74
12.3.1 Zone Configuration 74
12.3.2 Hazard Configuration 74

12.3.3 NAC Configuration 74
12.3.4 How the Panel Works in Mode 3 75
12.4 Mode 4: Agent Release, Dual Hazard, Not Cross-zoned, Split Release 76
12.4.1 Zone Configuration 76
12.4.2 Hazard Configuration 76
12.4.3 NAC Configuration 76
12.4.4 How the Panel Works in Mode 4 77
12.5 Mode 5: Pre-action/Deluge, Single Hazard, Cross-zoned, Combined Release 78
12.5.1 Zone Configuration 78
12.5.2 Hazard Configuration 78
12.5.3 NAC Configuration 78
12.5.4 How the Panel Works in Mode 5 78
12.6 Mode 6: Pre-action/Deluge, Single Hazard, Not Cross-zoned, Combined Release 80
12.6.1 Zone Configuration 80
12.6.2 Hazard Configuration 80
12.6.3 NAC Configuration 80
12.6.4 How the Panel Works in Mode 6 80
12.7 Mode 7: Pre-action/Deluge, Dual Hazard, Cross-zoned, Split Release 81
12.7.1 Zone Configuration 81
12.7.2 Hazard Configuration 81
12.7.3 NAC Configuration 81
12.7.4 How the Panel Works in Mode 7 82
12.8 Mode 8: Pre-action/Deluge, Dual Hazard, Not Cross-zoned, Split Release 83
12.8.1 Zone Configuration 83
12.8.2 Hazard Configuration 83
12.8.3 NAC Configuration 83
12.8.4 How the Panel Works in Mode 8 84
12.9 Mode 9: Agent Release, Single Hazard, Cross-zoned, NYC abort 85
12.9.1 Zone Configuration 85
12.9.2 Hazard Configuration 85
12.9.3 NAC Configuration 85
12.9.4 How the Panel Works in Mode 9 86
12.10 Mode 10: Agent Release, Single Hazard, Not Cross-zoned, Combined Release 87
12.10.1 Zone Configuration 87
12.10.2 Hazard Configuration 87
12.10.3 NAC Configuration 87
12.10.4 How the Panel Works in Mode 10 88
12.11 Mode 11: Agent Release, Single Hazard, Cross-zoned, Combined Release 89
12.11.1 Zone Configuration 89
12.11.2 Hazard Configuration 89
12.11.3 NAC Configuration 89
12.11.4 How the Panel Works in Mode 11 90
12.12 Mode 12: Pre-action/Deluge, Single Hazard, Cross Zoned, Combined Release 91
12.12.1 Hazard Configuration 91
12.12.2 NAC Configuration 91

12.12.3 How the Panel Works in Mode 12 92
12.13 Mode 13: Pre-action/deluge, Single Hazard, Not Cross Zoned, Combined Release ... 93
12.13.1 Zone Configuration 93
12.13.2 Hazard Configuration 93
12.13.3 NAC Configuration 93
12.13.4 How the Panel Works in Mode 13 93
12.14 Mode 14: Pre-action/deluge, Single Hazard, Not Cross Zoned, Combined Release 95
12.14.1 Zone Configuration 95
12.14.2 Hazard Configuration 95
12.14.3 NAC Configuration 95
12.14.4 How the Panel Works in Mode 14 96

13.0 Appendix A: Compatible Receivers 97

14.0 Appendix B: FR-320 Series Compatible Devices 98

14.1 FR-320 Series Compatible UL Listed Two-Wire Smoke Detectors 98
14.2 FR-320 Series ULC Listed Compatible Two-Wire Smoke Detectors 101
14.3 FR-320 Series Compatible Solenoids 102
14.4 FR-320 Series Fire Panel Max. Number of Horn/Strobes 102

15.0 Appendix C: Reporting 103

15.1 Ademco Contact-ID 103
15.1.1 FR-320 Event Codes 103
15.2 Security Industries Association SIA-DCS 104
15.2.1 FR-320 Event Codes 104

16.0 Appendix D: Specifications 105

17.0 Appendix E: Power Supply and Battery Calculations 108

18.0 Warranty & Warning Information 110

List of Figures

Figure 1 FR-320 Panel 17
Figure 2 Box dimensions, semi-flush mounting and trim ring 20
Figure 3 Flush Trim Detail 21
Figure 4 BBX-1024DS and BBX-1024DSR Installation Instructions and Dimensions 22
Figure 5 Installation of Adder Modules 23
Figure 6 Main Control Board cable connector and jumper settings 24
Figure 7 ICAC-306 Input Class-A Converter Adder Module 25
Figure 8 OCAC-302 Output Class-A Converter Adder Module 26
Figure 9 RM-306 six relay adder module 26
Figure 10 Polarity reversal and city tie module 27
Figure 11 Initiating circuit – Class B or Style B Wiring 28
Figure 12 Initiating circuit– Class A or Style D Wiring 28
Figure 13 Abort and Manual Release Switch Class B or Style B Wiring 29
Figure 14 Abort and Manual Release Switch Class A or Style D Wiring 30
Figure 15 Indicating circuit – Class B or Style Y wiring 31
Figure 16 Indicating circuit –Class A or Style Z wiring 31
Figure 17 Releasing Circuit Wiring 32
Figure 18 Dialer Wiring 32
Figure 19 Four-wire smoke detector wiring 33
Figure 20 Relay per zone (RM-306) Terminal connection 33
Figure 21 Polarity reversal and city tie module terminal connection 34
Figure 22 Power Supply Connection 35
Figure 23 LED indicators and control buttons 40
Figure 24 Evacuation and Alert Codes 47
Figure 25 FR-320 Configuration 48

List of Tables

Table 1 Power Supply Ratings 35
Table 2 Initiating Circuit Wiring Distances 36
Table 3 Indicating Circuit Wiring Distances 36
Table 4 Troubleshooting 39
Table 5 Relay Types 45
Table 6 Access Levels 49
Table 7 FR-320 Series Specifications 105
Table 8 FR-320 System Modules and Annunciators 106

1.0 Industry Canada and FCC Notice

1.1 Notice for all FR-320 Series Built-In UDACTs Sold in Canada

Mircom's ***FR-320 SERIES BUILT-IN UDACT Communicator*** described in this manual is listed by Underwriters Laboratories Canada (ULC) for use in slave application in conjunction with a Listed FR-320 series Pre-action/Deluge and Agent Release Control Panel under Standard ULC-S527 (Standard for Control Units for Fire Alarm Systems) and ULC/ORD-C693-1994 (Central Station Fire Protective Signalling Systems and Services). These Communicators should be installed in accordance with this manual; the Canadian / Provincial / Local Electrical Code; and/or the local Authority Having Jurisdiction (AHJ).

1.1.1 Industry Canada Notice

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alteration made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment. Users should ensure for their own protection that the **Earth Ground** connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This is necessary both for proper operation and for protection.

Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate

1.1.2 Notice for all FR-320 Series Built-in UDACTs Sold in the U.S.A.

Notes: The Ringer Equivalence Number (REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the Ringer Equivalence Numbers of all the devices does not exceed 5.

The REN for this product is part of the product identifier that has the format US:AAAEQ##TXXXX. The digits represented by ## are the REN without a decimal point (e.g., 03 is a REN of 0.3). For earlier products, the REN is separately shown on the label.

Mircom's ***FR-320 SERIES BUILT-IN UDACT Digital Communicator*** described in this manual is listed by Underwriters Laboratories Inc. (ULI) for use in slave application in conjunction with a listed Pre-action/Deluge and Agent Release Control Panel under Standard 864 (Control Units for Fire Protective Signalling Systems). These Communicators comply with the National Fire Protection Association (NFPA) performance requirements for DACTs and should be installed in accordance with NFPA 72 Chapter 4 (Supervising Station Fire Alarm System). These Communicators should be installed in accordance with this manual; the National Electrical Code (NFPA 70); and/or the local Authority Having Jurisdiction (AHJ).

1.1.3 FCC Notice

This equipment complies with Part 68 of the FCC rules and the requirements adopted by the ACTA. On the telco transformer of this equipment is a label that contains, among other information, a product identifier in the format US:AAAEQ##TXXXX. If requested, this number

must be provided to the telephone company. This equipment is capable of seizing the line. This capability is provided in the hardware.

Type of Service: The **Communicator** is designed to be used on standard device telephone lines. It connects to the telephone line by means of a standard jack called the USOC RJ-11C (or USOC FJ45S). Connection to telephone company provided coin service (central office implemented systems) is prohibited. Connection to party lines service is subject to state tariffs.

Telephone Company Procedures: The goal of the telephone company is to provide you with the best service it can. In order to do this, it may occasionally be necessary for them to make changes in their equipment, operations or procedures. If these changes might affect your service or the operation of your equipment, the telephone company will give you notice, in writing, to allow you to make any changes necessary to maintain uninterrupted service.

In certain circumstances, it may be necessary for the telephone company to request information from you concerning the equipment which you have connected to your telephone line. Upon request of the telephone company, provide the FCC registration number and the ringer equivalence number (REN); both of these items are listed on the equipment label. The sum of all of the REN's on your telephone lines should be less than five in order to assure proper service from the telephone company. In some cases, a sum of five may not be usable on a given line.

If Problems Arise: If any of your telephone equipment is not operating properly, you should immediately remove it from your telephone line, as it may cause harm to the telephone network. If the telephone company notes a problem, they may temporarily discontinue service. When practical, they will notify you in advance of this disconnection. If advance notice is not feasible, you will be notified as soon as possible. When you are notified, you will be given the opportunity to correct the problem and informed of your right to file a complaint with the FCC. Contact your telephone company if you have any questions about your phone line. In the event repairs are ever needed on the Communicator, they should be performed by Mircom Technologies Ltd. or an authorized representative of Mircom Technologies Ltd. For information contact Mircom Technologies Ltd. at the address and phone numbers shown on the back page of this document.

2.0 Introduction

Mircom's FR-320 Series Pre-Action/Deluge and Agent Release Control Panel performs the function of fire suppression in a wide variety of applications. It is capable of being used in an agent release sprinkler system or in a pre-action or deluge sprinkler system. It can be used in single-hazard or dual-hazard applications with or without cross-zoning. The panel includes common alarm, supervisory, and trouble relays, and provides regulated and unregulated auxiliary power along with four-wire smoke power. It supports auxiliary relays and a city tie module. The auxiliary relays are based on a hazard area status. The FR-320 has six input zones and four output zones, allowing for flexibility in most single and dual-hazard applications for both deluge and agent releasing applications.

2.1 Panel Type

The panel can function as an agent release panel or as a pre-action/deluge panel, depending on which of the available fixed configurations are chosen from the main programming menu.

2.1.1 Deluge sprinkler system

In deluge sprinkler system open-valve sprinkler heads terminate to a water supply that is controlled by a single valve. When the system detects fire, it automatically opens the valve via a releasing circuit, allowing the water to flow through all the sprinkler heads. Deluge sprinkler systems are useful for applications in which simultaneous discharge of water through every sprinkler is required.

2.1.2 Pre-action sprinkler system

In a pre-action sprinkler system close-valve sprinkler heads are connected to pipes that are supervised for air pressure. The pipes terminate directly to a water supply. Pre-action systems are useful for applications in which the prevention of an accidental discharge of water is required.

2.1.3 Agent release system

In an agent release system, an extinguishing agent (such as Argon, dry chemical, CO^2, Halon, etc.) is automatically released upon fire detection. An abort function is added to prevent the false release of the extinguishing agent.

2.2 Overall Features

- Basic unit has six Class B (Style B) initiating circuits, which may be configured as Class A (Style D) using input Class A converter adder modules. Each initiating circuit is pre-configured as Alarm, Supervisory (Latching or non-latching), water-flow, Manual Release Switch, Abort Switch or Manual Release/Abort combination, depending upon the selected pre-programmed configuration. There are two LEDs per circuit, one for Trouble (amber), and one dual color (amber/red) LED for Supervisory (amber) and Alarm (red).
- Basic unit has 4 power limited class B (style Y) output circuits. Output circuits 1 & 2 are indicating circuits while output circuits 3 & 4 are releasing circuits (circuit 4 can work as an indicating circuit in some situations; check Pre-Programmed Modes on page 70 for details). Each indicating circuit process type is pre-configured and can be silenceable. The signal rates depend on the selected pre-programmed configuration.
- A pushbutton associated with each initiating, indicating and releasing circuit can individually bypass the circuit.

- Configurable Signal Silence Inhibit and Auto Signal Silence Timers.
- Subsequent Alarm, Supervisory, and Trouble operation.
- Four wire reset-able smoke power supply.
- Relay Contacts for Common Alarm, Common Supervisory, Common Trouble, and Auxiliary Alarm Relay (disconnectable).
- RS-485 Interface for RA-1000 Series Remote Multiplex Annunciators and Smart relay Module.
- Optional Modules for additional Relay Circuits, City Tie and Polarity Reversal Signaling.
- Extensive transient protection.
- Easy configuration of the panel using LCD service tool (CFG-300).
- Releasing circuit protection from false alarm by disconnecting the battery if the voltage falls below 19V.

3.0 Conventions

3.1 Circuits

Refers to an actual electrical interface for initiating (detection), indicating (signal), and releasing.

3.2 Zone

Is a logical concept for a Fire Alarm Protected Area, and will consist of at least one Circuit.

Often the terms Zone and Circuit are used interchangeably, but in this Manual the term Circuit is used.

3.3 Display Points

There is a display point associated with every initiating and indicating circuit of the FR-320 LED Series fire panel. For an initiating circuit there are two LEDs for every display point: one single color (amber) and one dual color (red/amber). For an indicating circuit there is only one LED: one single color (amber), for every display point.

3.4 Wiring Styles

Initiating and indicating circuits are Class B (Style B and Y). Changing the initiating circuits to Class A requires an ICAC-306 adder board which will convert SIX initiating zones from Class B (Style B) circuits to Class A (Style D). This is done without penalizing the number of circuits, which remains the same as in Class B (Style B). Changing the indicating circuits to Class A requires an OCAC-302 adder board, which will convert TWO indicating zones from Class B (Style Y) circuits to Class A (Style Z). Releasing circuits (Z) are Class B (Style B) only.

4.0 System Components

4.1 Main Pre-Action/Deluge and Agent Release Control Panel

The following models are part of the FR-320 Series:

- FR-320
- FR-320-W
- FR-320-R
- FR-320-DW
- FR-320-DR

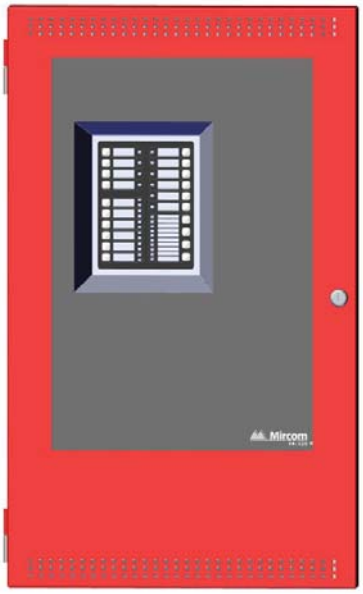


Figure 1 FR-320 Panel

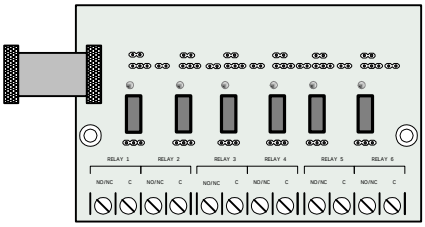
All FR-320 Panels have the following features:

- Six Zone Pre-Action/Deluge and Agent Release Control Panel with LED display (red or white door, black box.
- six Class B (Style B) initiating circuits, and four Class B (Style Y) output circuits
- Output circuits 1 & 2 are Class B (Style B) indicating circuits that can be converted to Class A (Style Z) using an **OCAC-302 Output Class A Converter** adder module.
- Output circuits 3 & 4 are Class B (Style B) only releasing circuits.
- Each output circuit can draw 1.7A current, 5A total. A six zone **ICAC-306 Input Class A Converter** adder module may be used for Class A (Style D) wiring of Initiating circuits.
- The FR-320 contains Common Alarm, Common Supervisory & Common Trouble Relays, auxiliary alarm relay (disconnectable), an RS-485 Interface for Remote Annunciators and a Resettable Four Wire Smoke Detector Power Supply.
- Two batteries are required.

Additionally:

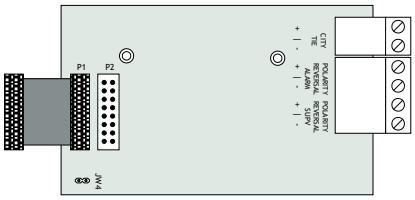
- FR-320-DW/R panels contain a dialer.
- FR-320 uses a BBX-1024DS or BBX-1024DSR enclosure.

4.2 Relay Modules: Six Relays



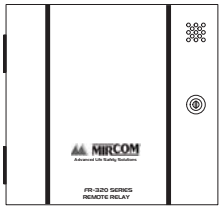
Model	Description
RM-306	Six-relay adder module

4.3 Polarity Reversal/City Tie



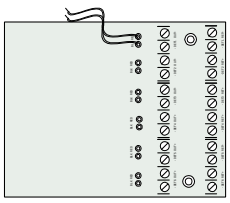
Model	Description
PR-300	Polarity Reversal and/or City Tie Module

4.4 Smart Relay Module



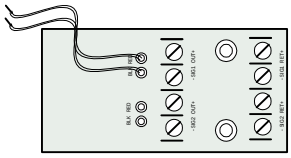
Model	Description
SRM-312W	Smart Relay Module (12 relays) with white enclosure
SRM-312R	Smart Relay Module (12 relays) with red enclosure

4.5 Input Class A Converter: Six Circuits



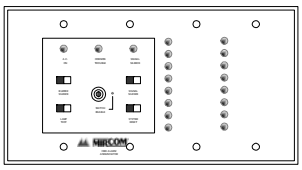
Model	Description
ICAC-306	Input Class A converter Module (six circuits). This module has built-in active EOL resistors.

4.6 Output Class A Converter: Two Circuits



Model	Description
OCAC-302	Output Class A converter module (two circuits)

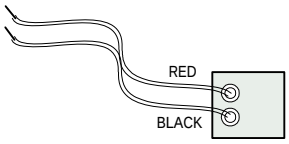
4.7 RAM-216 Remote Annunciator



Model	Description
RAM-216	16 Zone remote annunciator

4.8 Active end-of-line

The ELRX-300R(W) are power-saving End-of-Line resistors that eliminate the need for an additional battery cabinet or larger batteries in order to meet the 60 hour standby requirement.



Model	Description
ELRX-300	Active end-of-line resistor without plate
ELRX-300R	Active end-of-line resistor with end-of-line red plate

4.9 Additional System Accessories

RAM-208	Eight Zone Remote Annunciator	(ULC and ULI Approved)
RTI-1	Remote Trouble Indicator	(ULC and ULI Approved)
RAM-1016/TZ	Remote Annunciator	(ULC and ULI Approved)
RAM-1016TZDS	Remote Annunciator	(ULC and ULI Approved)
MP-300	EOL resistor plate, 3.9KΩ	(ULC and ULI Approved)
MP-300R	EOL resistor plate, red	(ULC and ULI Approved)
BC-160	External Battery Cabinet	(ULC and ULI Approved)
MP-1500R/W	Current Limiter	(ULC and ULI Approved)
MP-320R/W	Solenoid EOL Module	(ULC and ULI Approved)

5.0 Mechanical Installation

Note: Installation, use and maintenance should be in accordance with the manufacturer's documents and the National Electrical Code, ANSI/NFPA 70, and the National Fire Alarm Code ANSI/NFPA 72.

5.1 Installing the Enclosure

Install the FR-320 Series panel enclosure as shown below. Mount enclosure surface mount using the four mounting holes with the provided screws.

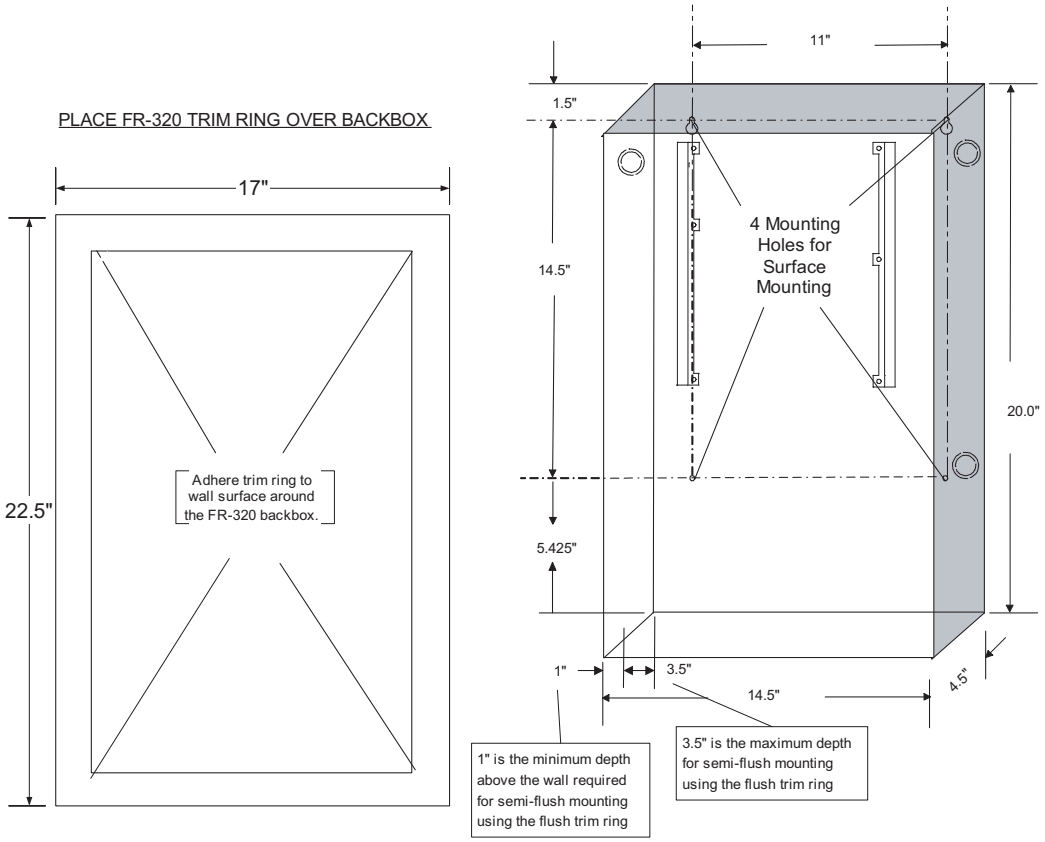


Figure 2 Box dimensions, semi-flush mounting and trim ring

Remove the door (also disconnect the ground strap), the dead front and semi-flush mount the backbox into the wall. Peel the adhesive cover from the trim ring and stick to the wall surface around the backbox, after wall is finished.

The figure below shows a cross-section of the semi-flush mounted backbox and the trim ring. **Make sure to allow a** minimum depth of 1” above the wall surface for proper door opening.

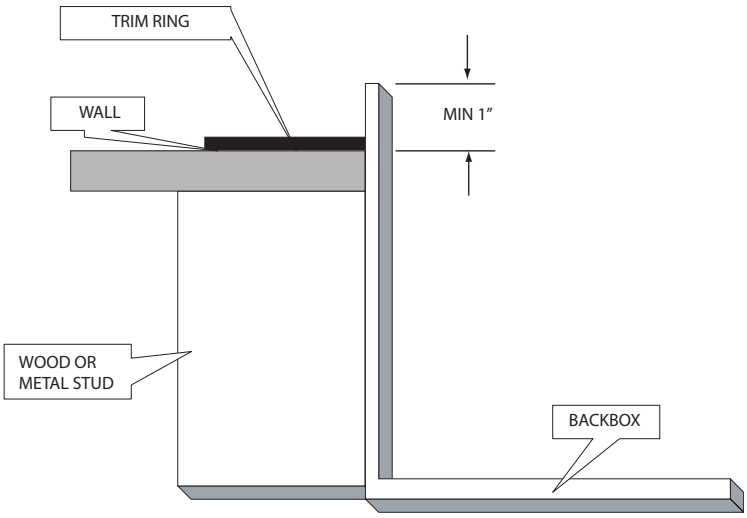


Figure 3 Flush Trim Detail

5.2 BBX-1024DS and BBX-1024DSR Mechanical Installation

The BBX-1024DS and BBX-1024DSR are suitable for flush or surface mounting, and have a built-in trim ring.

Dimensions of Enclosure (minus built in trim ring)	14 1/2” x 4 1/4” x 26”
Distance between horizontal mounting screws	12”
Distance between vertical mounting screws	23 1/2”
Complete Dimensions of Enclosures	16 3/4” x 5 1/2” x 28”

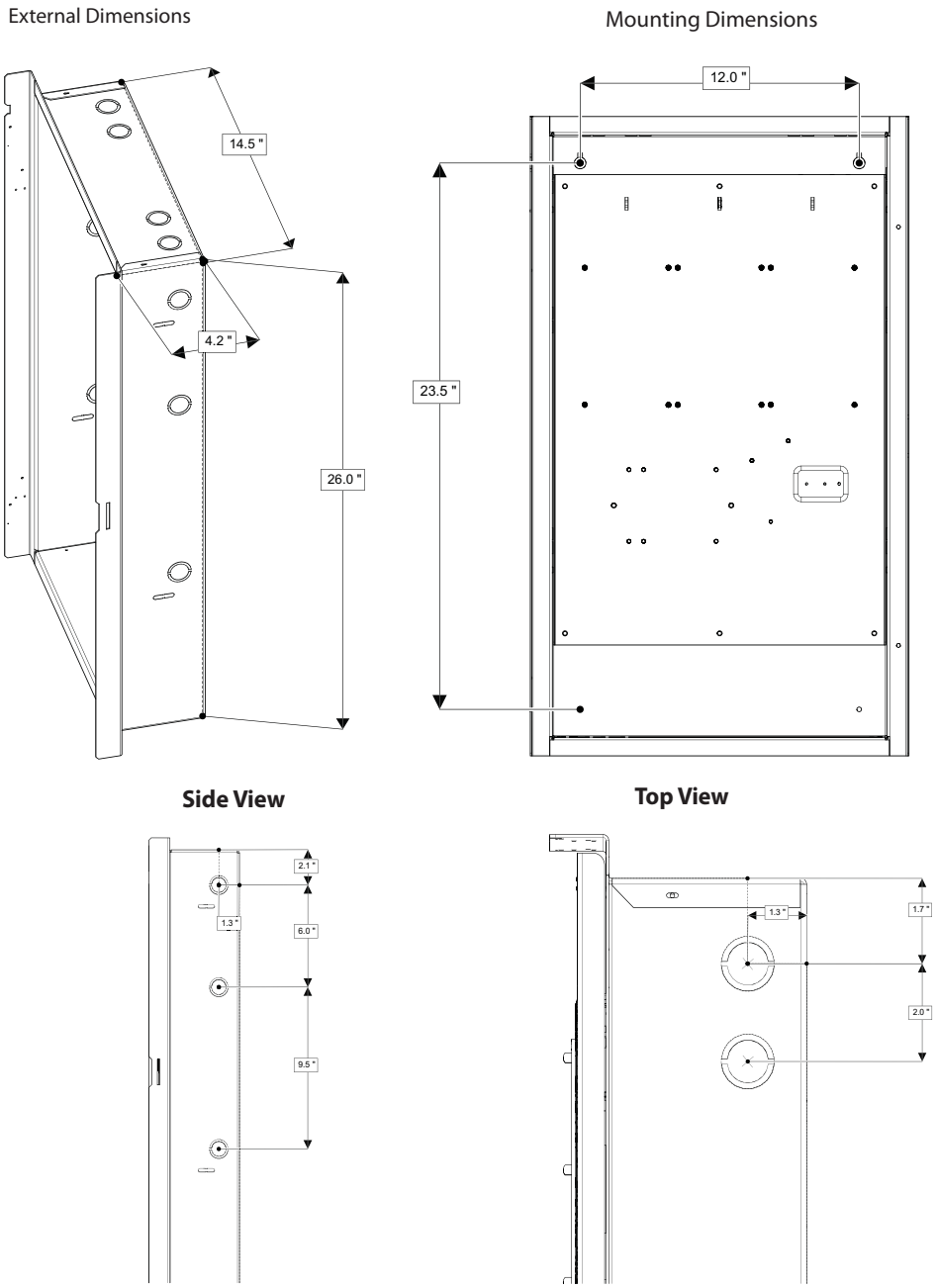


Figure 4 BBX-1024DS and BBX-1024DSR Installation Instructions and Dimensions

5.3 Installing the Adder Modules

The FR-320 Series panel comes pre-assembled with all components and boards except for adder modules. Module installation locations are shown below. Refer to *Figure 3* on the next page for Jumper or DIP Switch settings and see *7.7 Wiring Tables and Information on page 36* for wiring specifications.

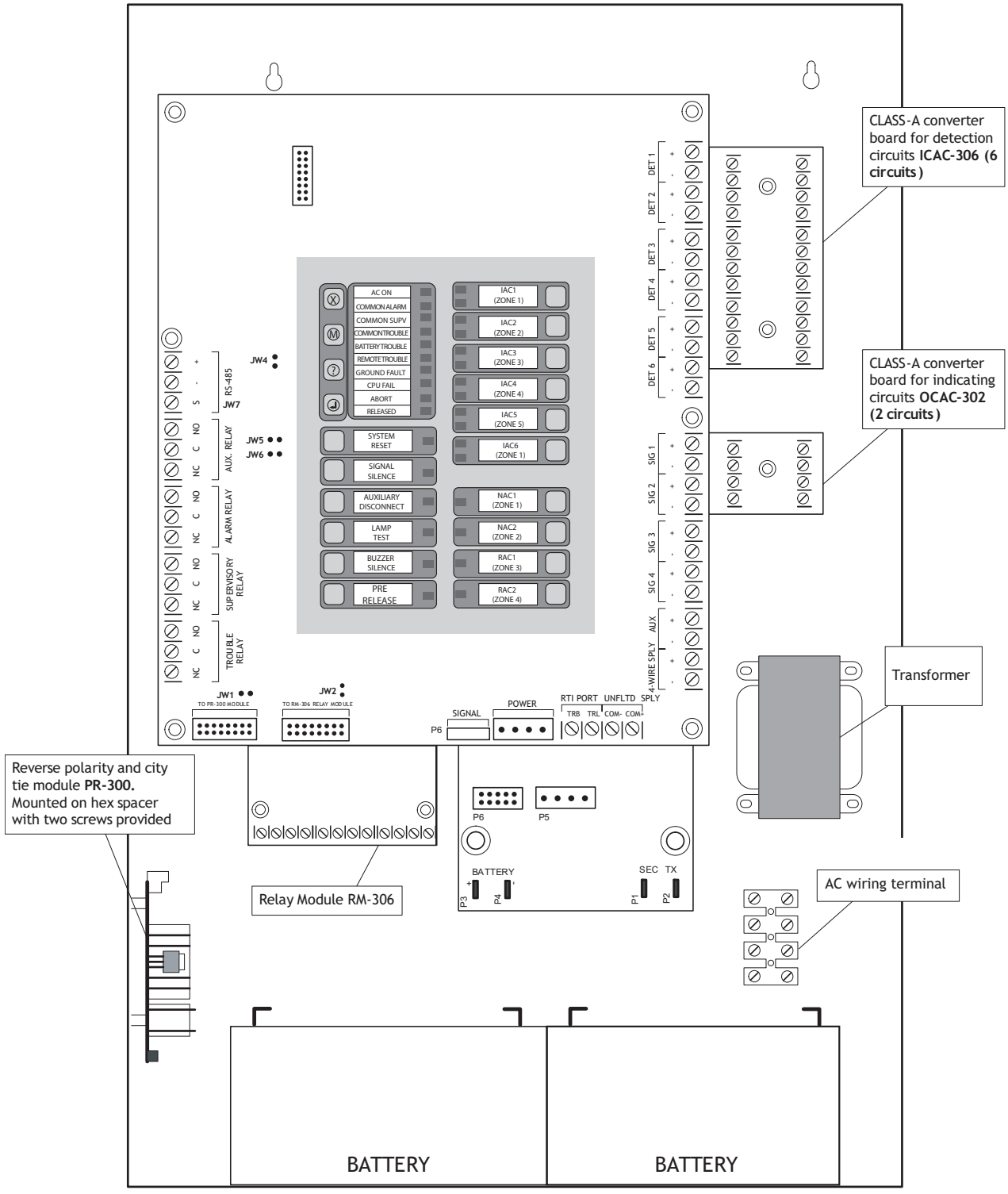


Figure 5 Installation of Adder Modules

6.0 Cable and Jumper Connections for Main Board, Core Board and Adder Modules

6.1 Main Pre-Action/Deluge and Agent Release Control Board

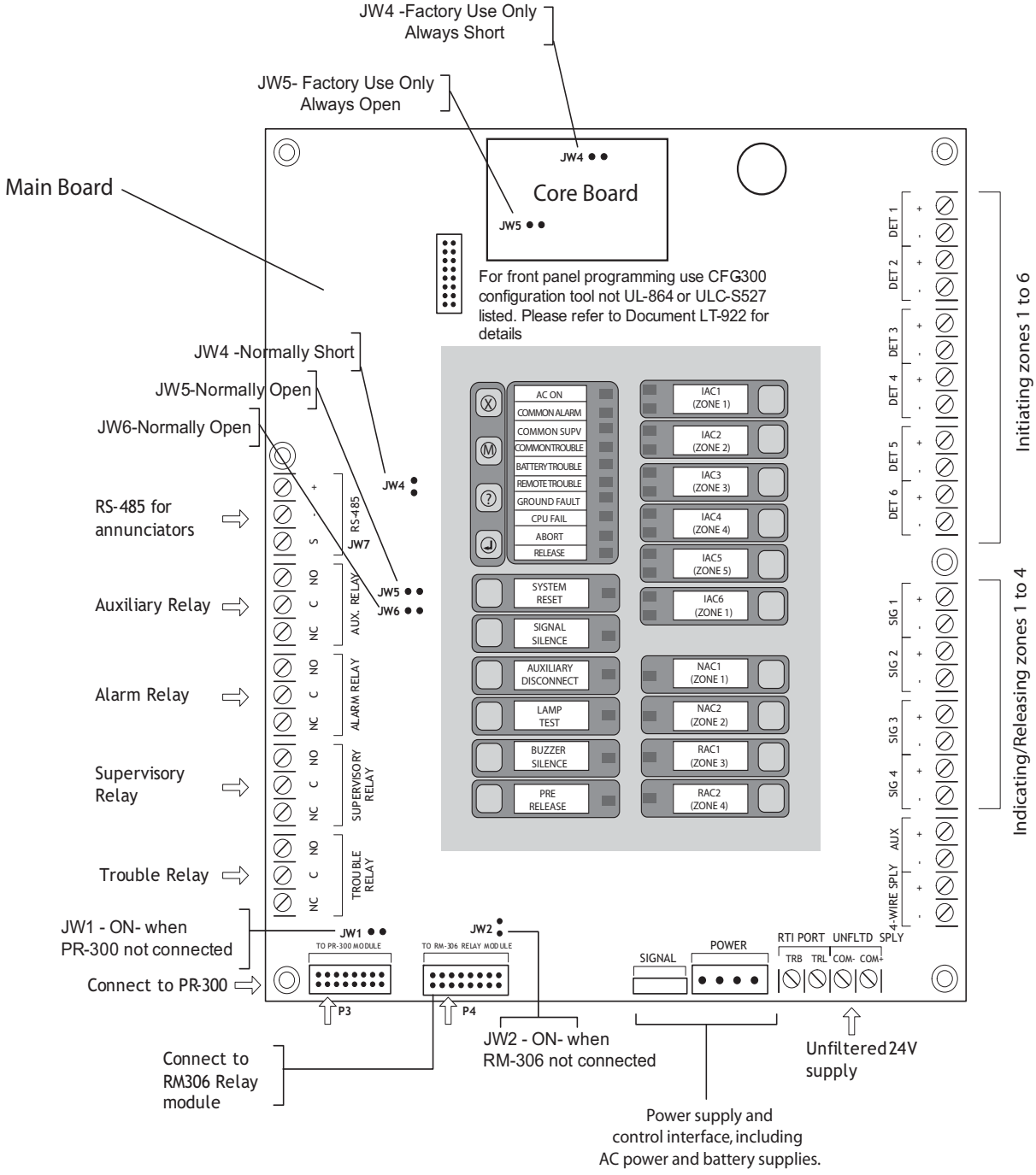


Figure 6 Main Control Board cable connector and jumper settings

6.1.1 Connectors and Jumpers on the Main Fire Alarm Board

JW1 Remove this jumper if **PR-300** is connected.

P4 Cable from connector **P1** of the **RM-306 Relay Adder Module** connects here. Otherwise not used.

JW2 Remove this jumper if an **RM-306 Relay Adder Module** is used.

JW4 Shorted if there is no external unit on RS485. This jumper works as 'end of line' jumper. If one or more units are connected on RS485, only short on the last connected unit. JW4 on all other units should be left open.

JW5 Normally open. To reset the password, place jumper here and power down the panel (both AC power and batteries). Then power up the panel again, the password is restored to the default after system startup. Once the system has reset, **REMOVE** the jumper from the pins at JW5.

JW6 Normally open to BLOCK configuration via modem, PC with a UIMA converter module or a CFG-300 Configuration Tool. Place jumper here to ALLOW any type of configuration.

6.1.2 Connectors and Jumpers on the Core Board

JW4 Factory Use Only. Always Short.

JW5 Factory Use Only. Always Open.

6.2 ICAC-306 Input Class-A Converter Adder Module

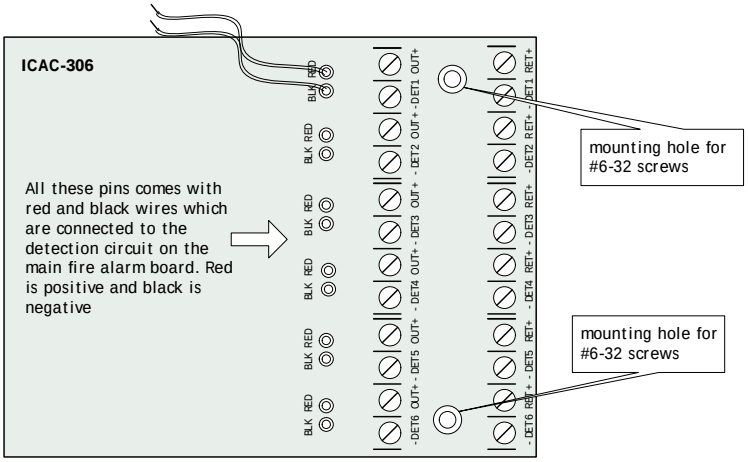


Figure 7 ICAC-306 Input Class-A Converter Adder Module

There are no jumpers or cables to set on this module, just wiring from the converter (wires are fixed here) to the Main Fire Alarm Board.

Initiating circuits must be wired from the ICAC-306 module to the Main Fire Alarm board. For example, Initiating circuit 1 positive (red) and negative (black) wires are connected to the positive and negative terminals (respectively) of Initiating circuit 1 on the Main Fire Alarm Board. From the ICAC-306 converter Initiating circuits are wired out to the devices from the positive and negative terminals marked DET OUT and the circuit return wires are brought back to the converter module to positive and negative terminals marked DET RET.

6.3 OCAC-302 Output Class-A Converter Adder Module

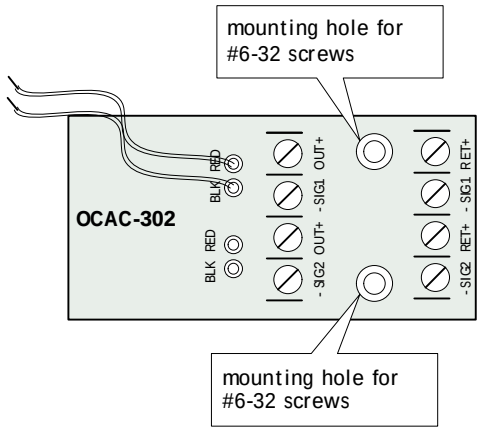


Figure 8 OCAC-302 Output Class-A Converter Adder Module

Indicating circuits must be wired from the OCAC-302 to the main Fire Alarm board. For example indicating circuit 1 positive (red wire) and negative (black wire) is wired from the Class A converter module to the positive and negative terminals of Indicating circuit 1 on the Main Fire Alarm board.

The actual indicating zone is wired from the SIGNAL OUT positive and negative to the signaling devices and then wired back to the SIGNAL RET positive and negative.

6.4 RM-306 Relay Adder Module

Cable from P1 of the RM-306 is connected to P4 on the Main Fire Alarm Board. The jumpers located above each relay on the RM-306 are used to configure the relays. The jumpers located below the relays are used to select either normally open contacts or normally closed contacts.

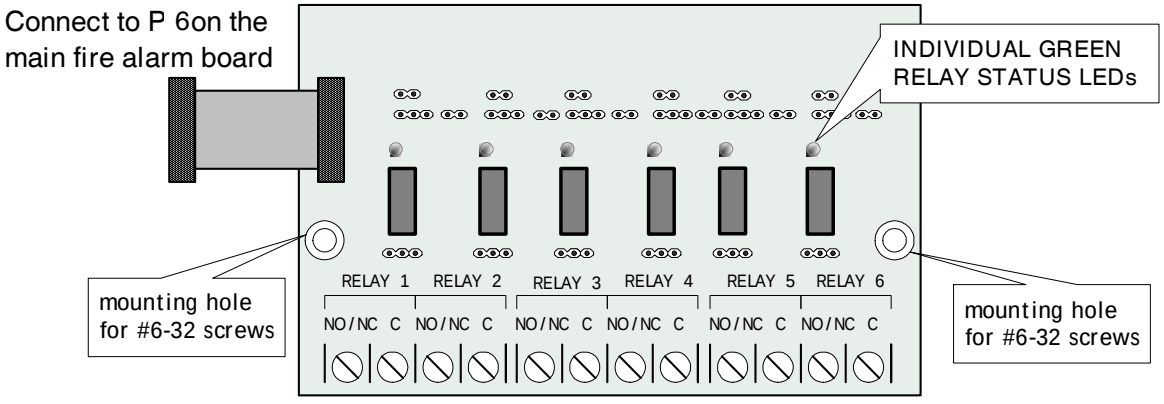


Figure 9 RM-306 six relay adder module

6.4.1 RM-306 Jumpers

P1 Cable from RM-306 Relay Adder Module connects to P4 on Main Fire Alarm Board.

6.4.2 RM-306 Correlations

The correlation of the relays are fixed and is as follows:

	Relay1	Relay2	Relay3	Relay4	Relay5	Relay6
Active State	Hazard 1 Alert	Hazard 1 Alarm	Hazard 1 Release	Hazard 2 Alert	Hazard 2 Alarm	Hazard 2 Release

6.5 Polarity Reversal and City Tie Module (Model PR-300)

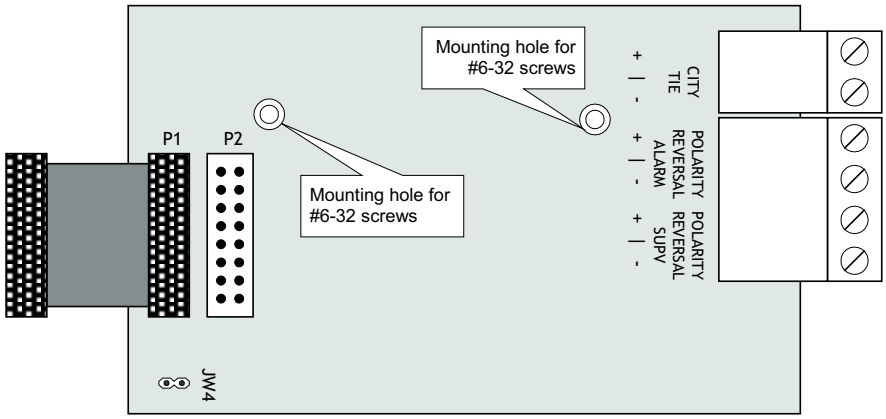


Figure 10 Polarity reversal and city tie module

The following hardware configuration must be performed before installing the PR-300.

6.5.1 PR-300 jumper settings

P1 Cable connects to **P3** on the **Main Board**

P2 & JW4 Not used. Jumper JW4 remains on board.

The Alarm Transmit signal to the PR-300 can be programmed to turn OFF when signal silence is active. This allows the City Tie Box to be manually reset. On subsequent alarms the silenceable signals will resound and the City Tie Box will be retriggered. See *8. Alarm Xmit-Sil. on page 55* for more information.

The Trouble Transmit signal to the PR-300 can be programmed to delay AC power fail for 0, 1 or 3 hours if this is the only system trouble. See *9. Pwr Fail Tmr on page 55* for more information.

7.0 Field Wiring

7.1 Main Board Field Wiring

Wire devices to the terminals as shown in the figures that follow. Refer to *7.7 Wiring Tables and Information on page 36* for wire gauges and *16.0 Appendix D: Specifications on page 105* for specifications.

Caution: Do not exceed power supply ratings.

7.1.1 Initiating Circuit Wiring

Wiring diagrams for the initiating circuits are shown below. The panel supports Style B wiring for the initiating circuits and Style D wiring for the indicating circuits. The initiating circuits are supervised by a 3.9KΩ EOL resistor or an active EOL module.

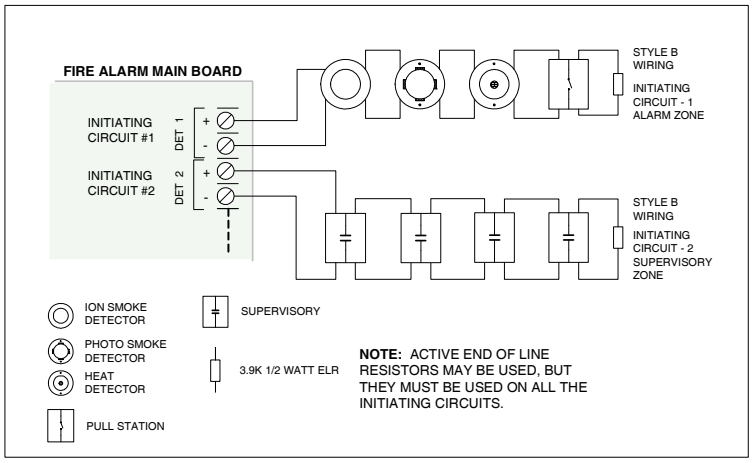


Figure 11 Initiating circuit – Class B or Style B Wiring

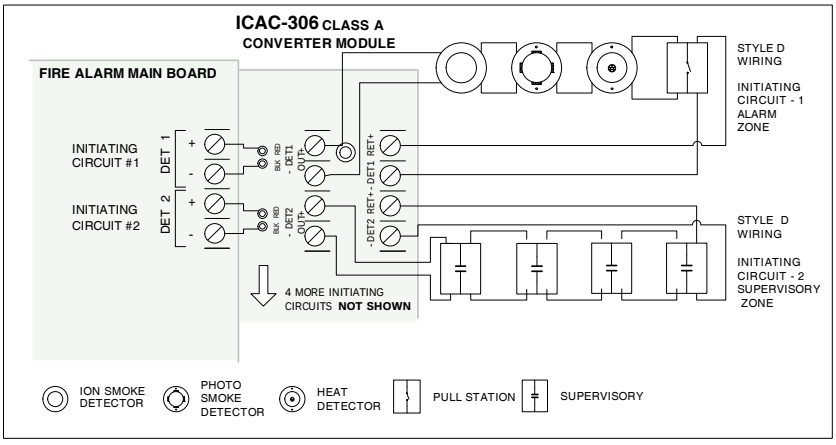


Figure 12 Initiating circuit– Class A or Style D Wiring

7.2 Abort and Manual Release Switch Wiring

Wiring for the abort and manual release switches is shown in *Figures 10* and *11*. Depending on the selected mode, the Abort and Manual release switches can either be on different circuits or they both can be on the same circuit. When on separate circuits, DET5 is used for the Abort switch and DET6 is used for the manual release switch. When on the same circuit, DET 5 Abort/Manual release combination is for hazard area 1, while DET6 Abort/Manual release combination is for hazard area 2. When an Abort/Manual release combination is used, ensure that the Manual release switch is always before the Abort switch. Also ensure that there is a current limiting resistor (MP-1500R/W) between the Manual release and Abort switch for differentiating between the two switches.

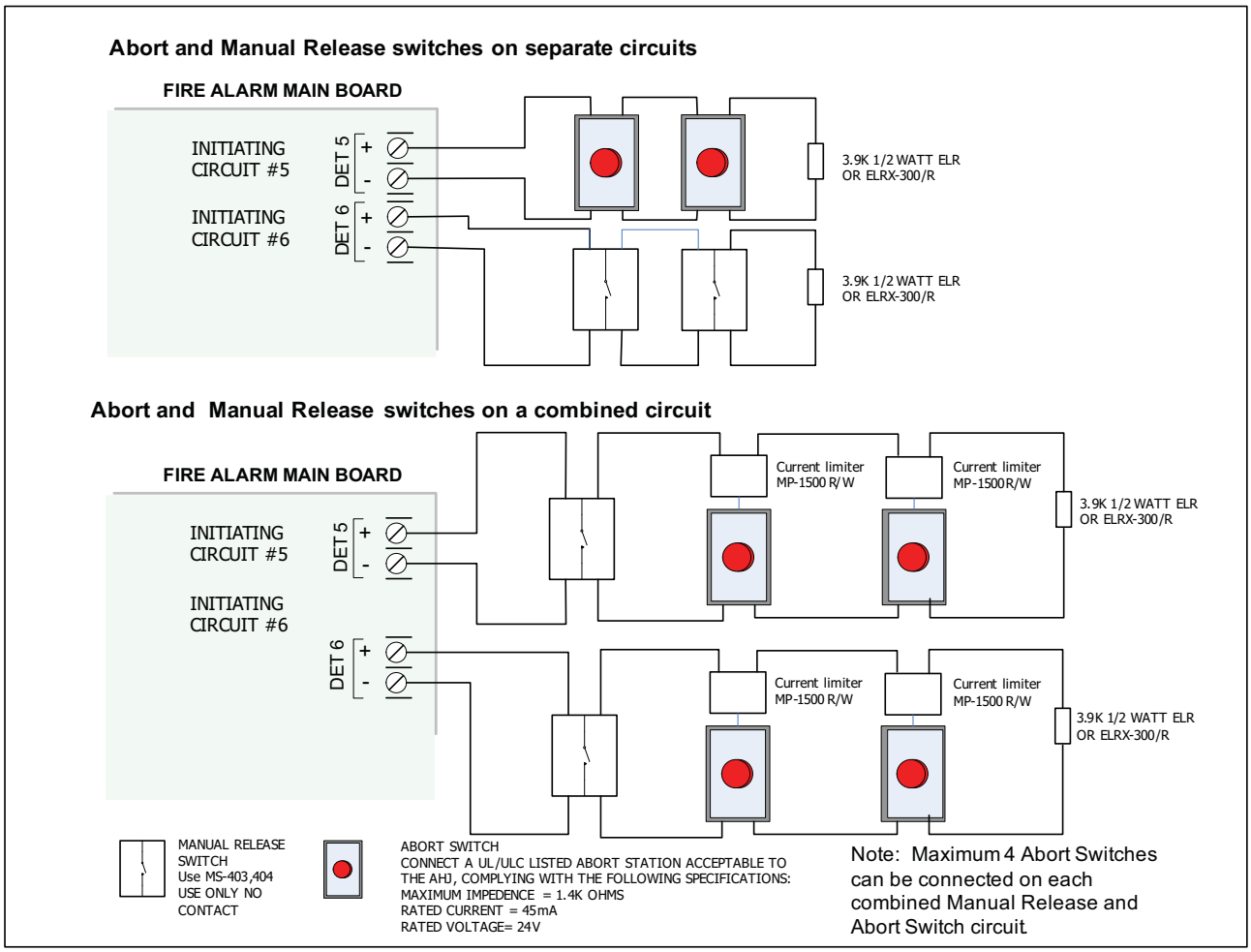


Figure 13 Abort and Manual Release Switch Class B or Style B Wiring

Note: For the circuit with the combined Abort Switch and Manual Release Switch, a maximum of four Abort Switches can be connected.

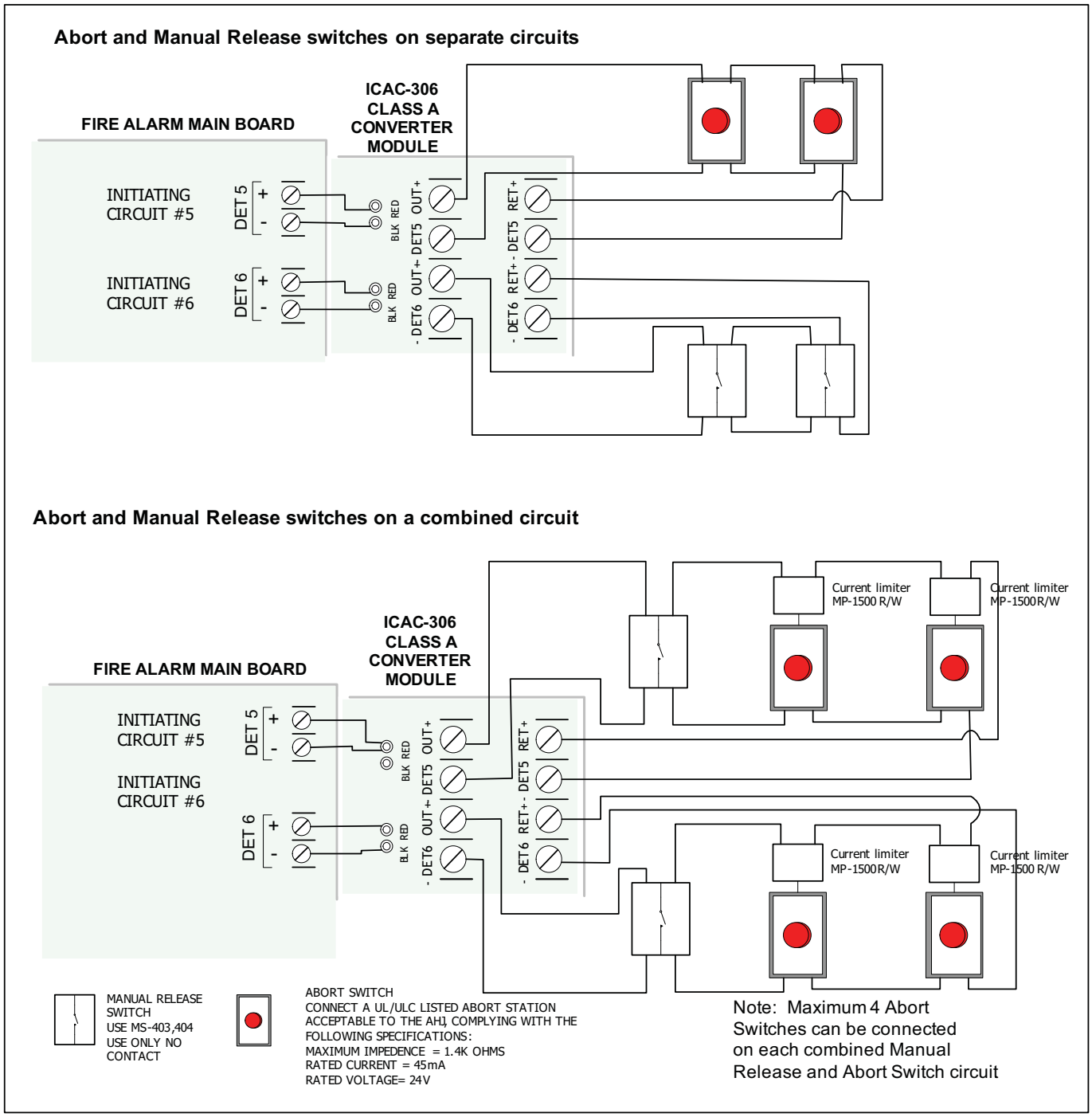


Figure 14 Abort and Manual Release Switch Class A or Style D Wiring

7.3 Indicating Circuit Wiring

The FR-320 Series Fire Alarm supports Class B or Style Y and Class A Style Z wiring for its indicating circuits. Each circuit is supervised by a 3.9KΩ EOL resistor or active EOL module. Each indicating circuit provides up to 1.7 A, 5 A maximum total if no auxiliaries are used.

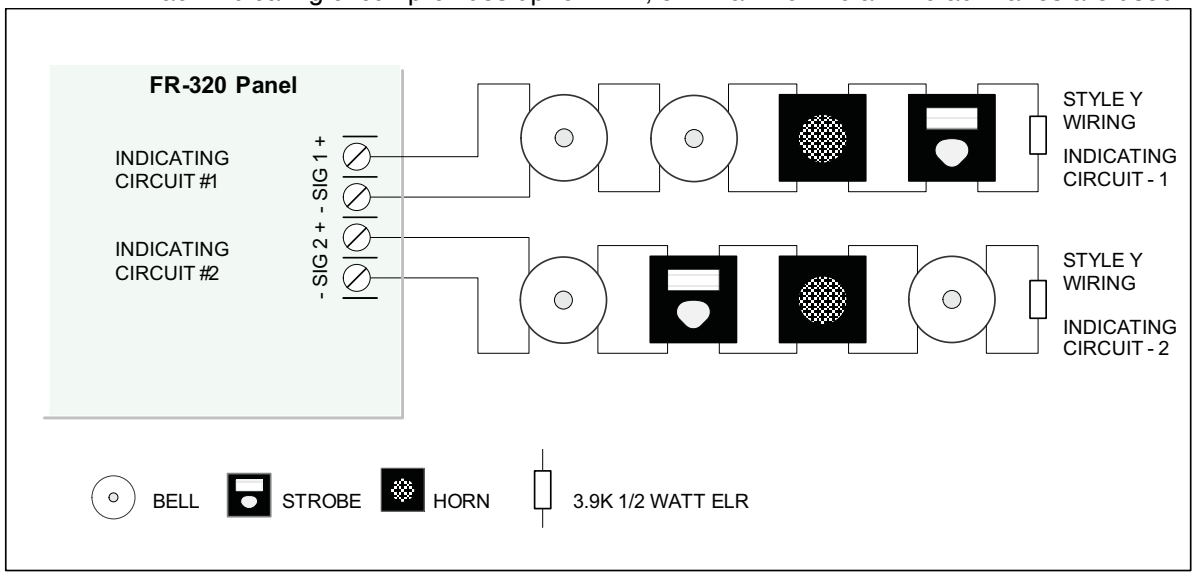


Figure 15 Indicating circuit – Class B or Style Y wiring

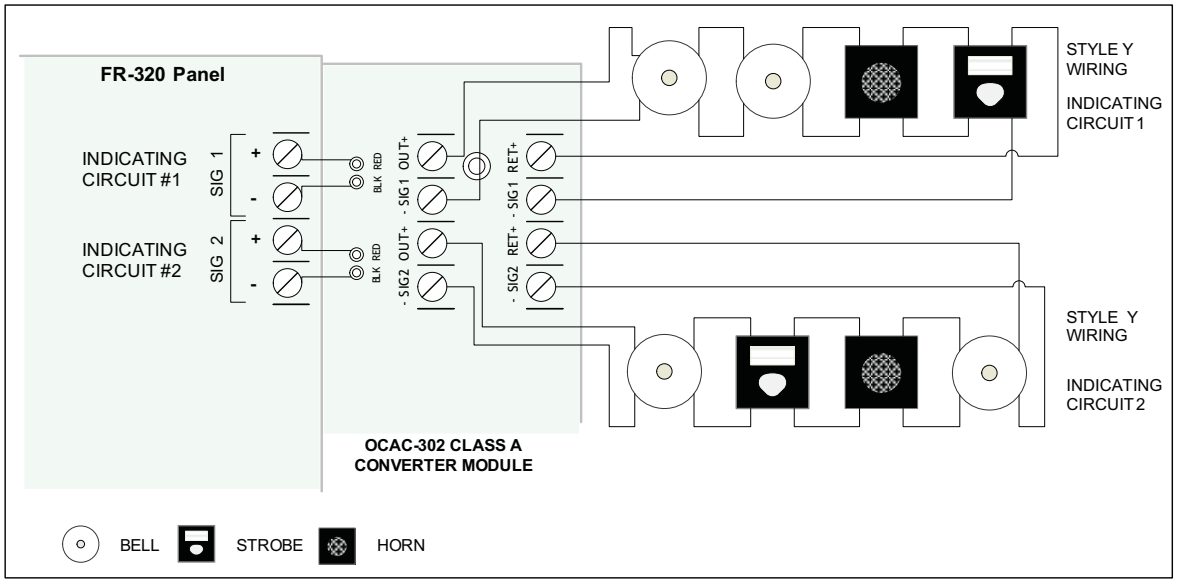


Figure 16 Indicating circuit –Class A or Style Z wiring

7.3.1 Releasing Circuit Wiring

Wiring for the releasing circuit is shown in *Figure 14* below. SIG3 and SIG4 output circuits are reserved for the releasing circuits. Solenoid EOL module (MP-320R/W) is used to supervise the solenoid coil. If the solenoid is already fitted with the directional diode then only the 3.9KΩ EOL resistor is used. The supervisory current passes through the solenoid coil thus confirming the integrity of the solenoid coil for open coil. The wiring is supervised for the open and short conditions.

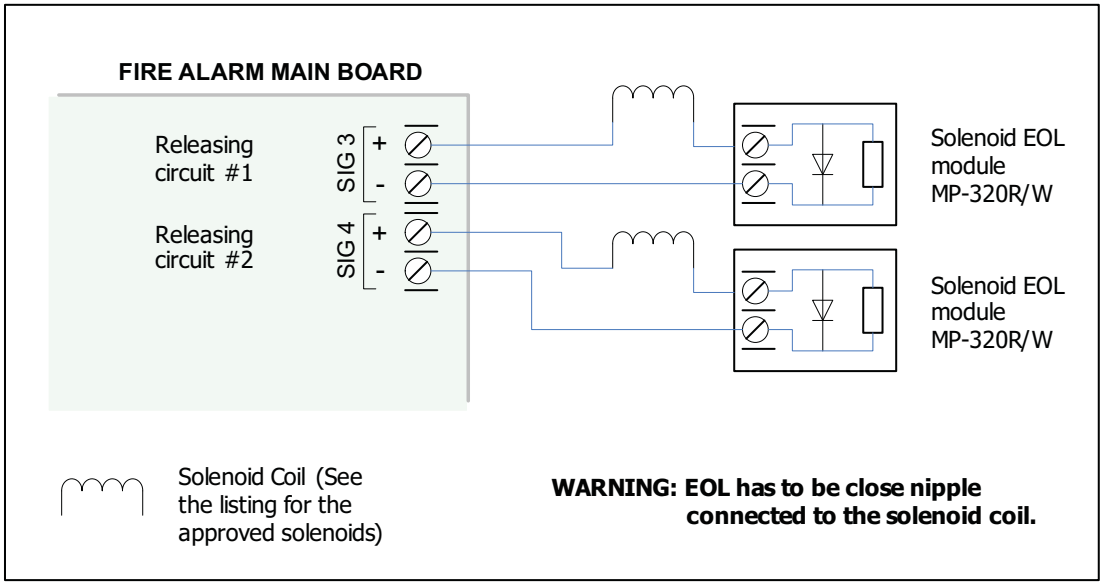


Figure 17 Releasing Circuit Wiring

7.4 Dialer Wiring

If you have an FR-320D, there is a dialer on board and terminals marked Line 1 and Line 2 must be wired as shown in *Figure 15* below.

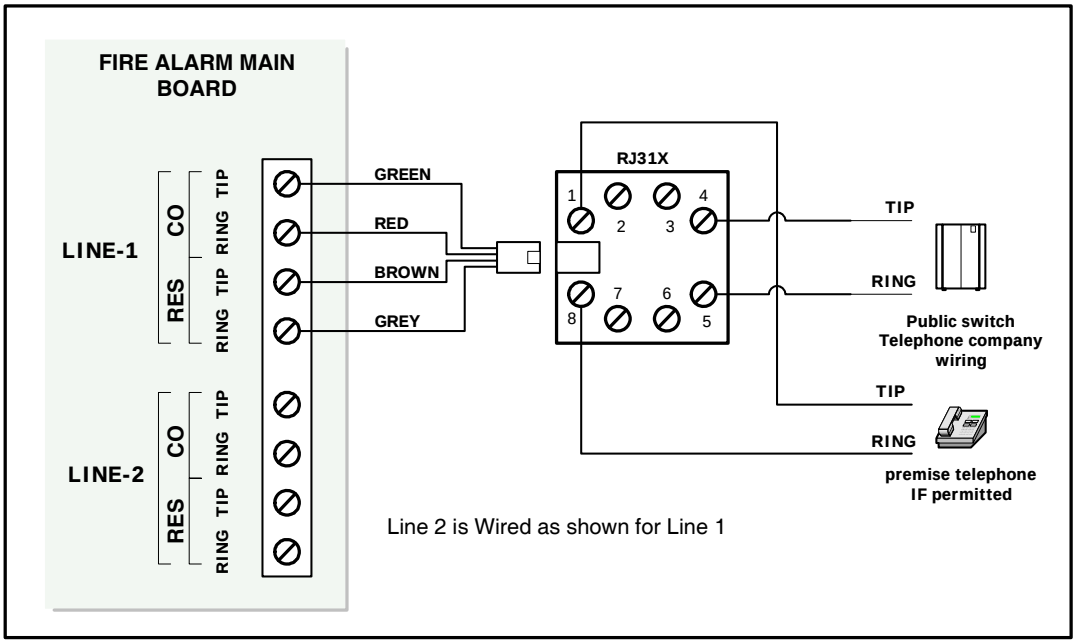


Figure 18 Dialer Wiring

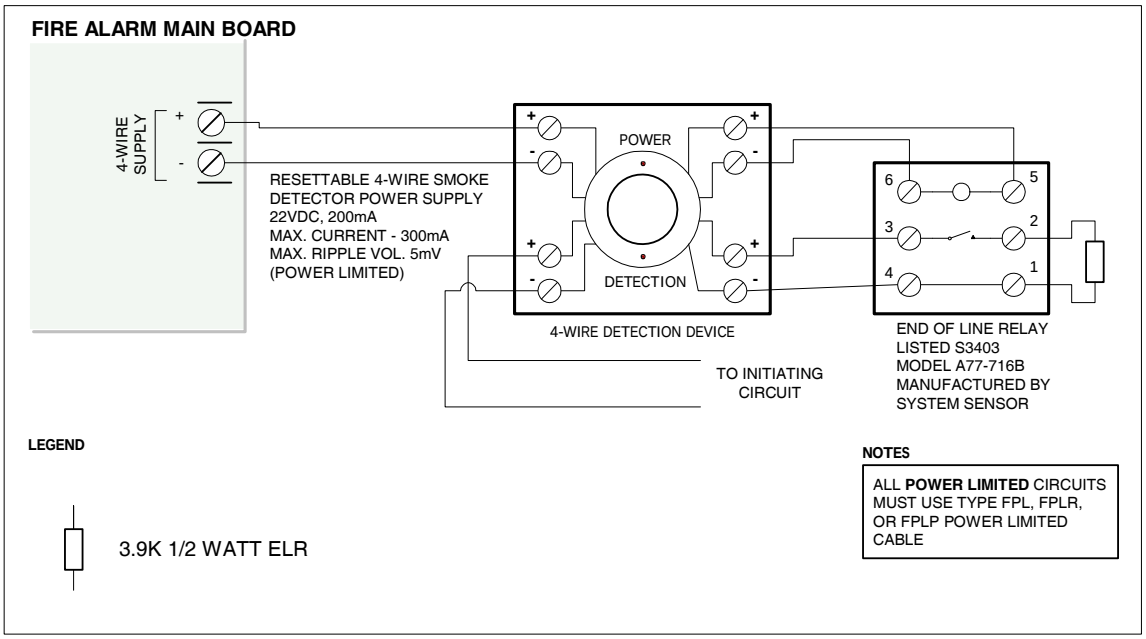


Figure 19 Four-wire smoke detector wiring

7.5 Relay Adder Module Wiring

Wire relays on the relay adder module RM-306 as shown in Figure 17.

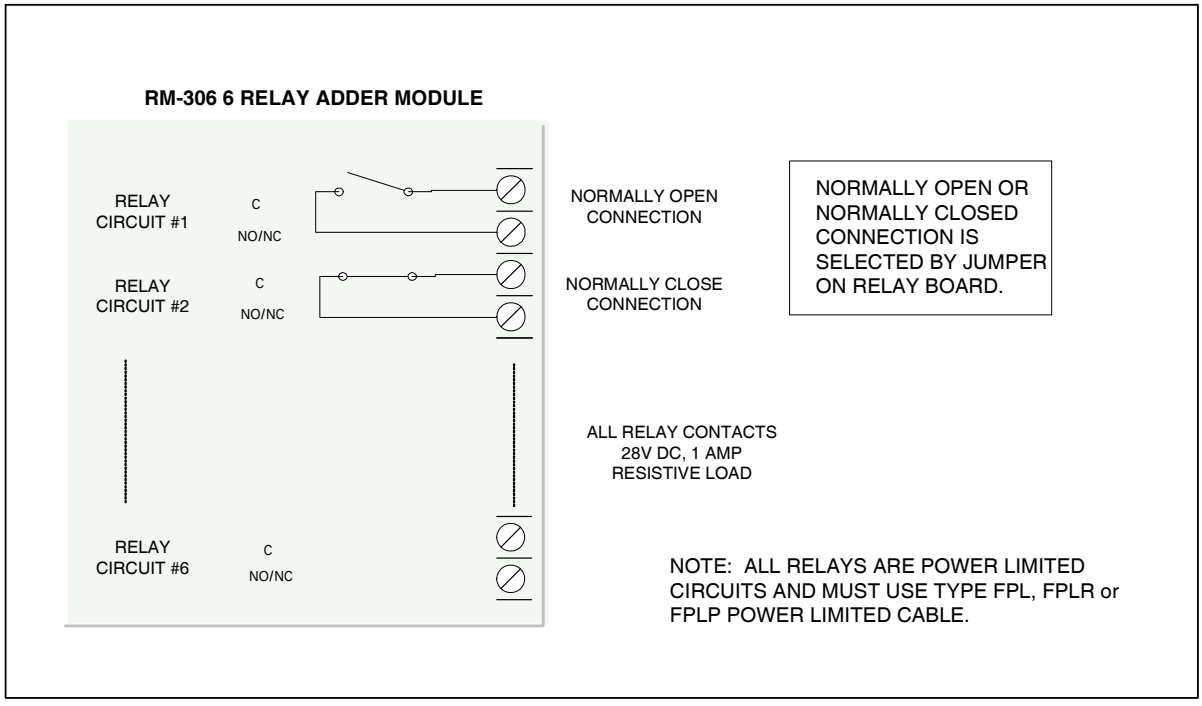


Figure 20 Relay per zone (RM-306) Terminal connection

7.6 Polarity Reversal and City Tie Module (PR-300) Wiring

Wire PR-300 Polarity Reversal and City Tie Module (if used) as shown in *Figure 18* below. See *16.0 Appendix D: Specifications on page 105* for module specifications. Power Limited cable type FPL, FPLR or FPLP must be used.

For USA installation, the installer must use **Atlantic Scientific (Tel: 407-725-8000), Model #24544 Protective Device**, or similar **UL-Listed QVRG secondary protector**, as shown.

For use in Canada, the Protective Device is not required but still recommended.

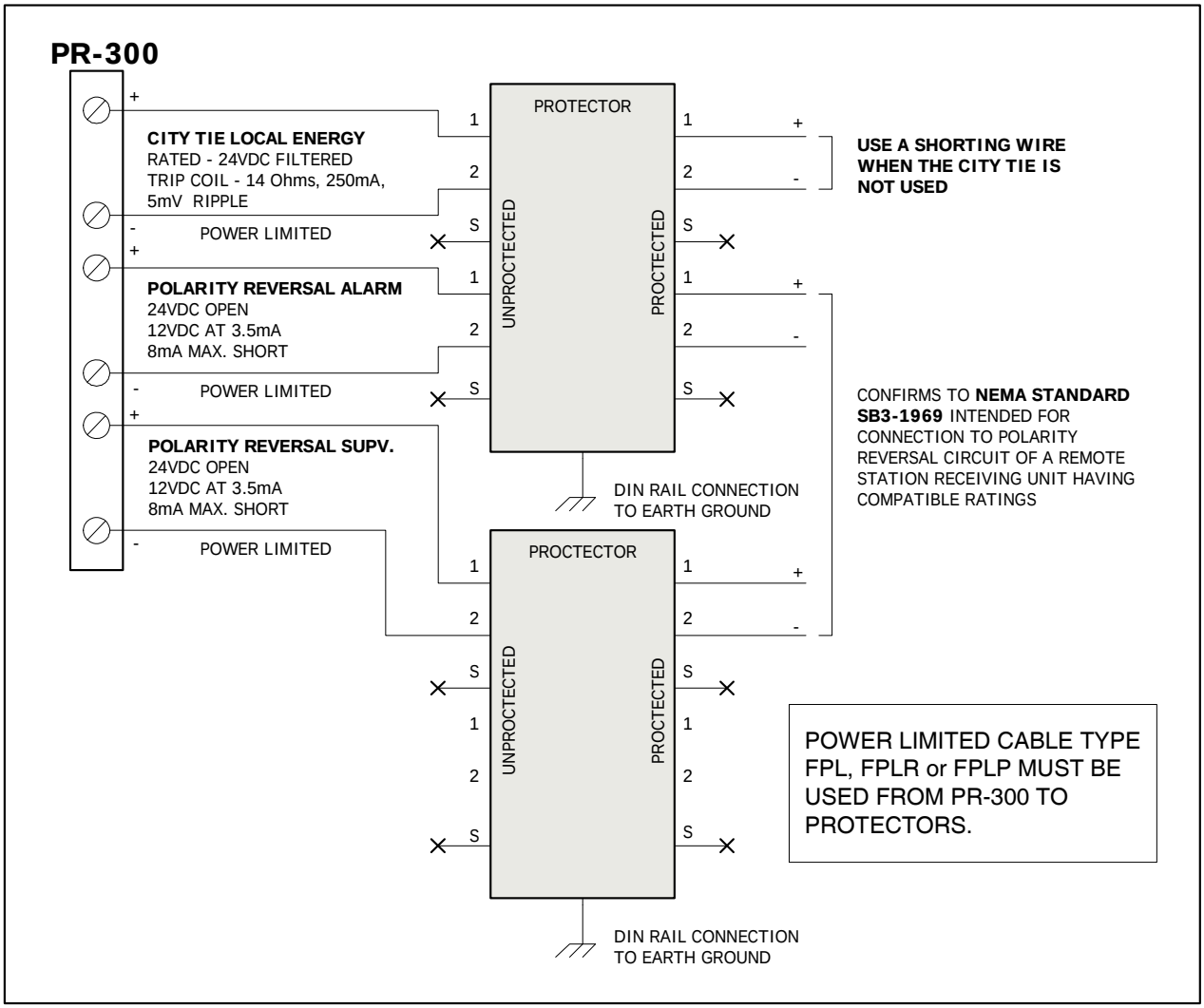


Figure 21 Polarity reversal and city tie module terminal connection

7.6.1 Power Supply Connection

The power supply is part of the Main Chassis. The ratings are:

Table 1 Power Supply Ratings

Type	Rating
Electrical Input rating	120 VAC 60Hz 1.7A /240 VAC 50 Hz 0.85 A, 10A slow blow fuse on secondary of transformer
Power supply total current	6.5A AC maximum @ secondary of transformer
Battery fuse on Main module	10A, slow blow micro fuse

Wire the power supply as shown below in *Figure 19* using the proper wire gauge.

Caution: Do not exceed power supply ratings.

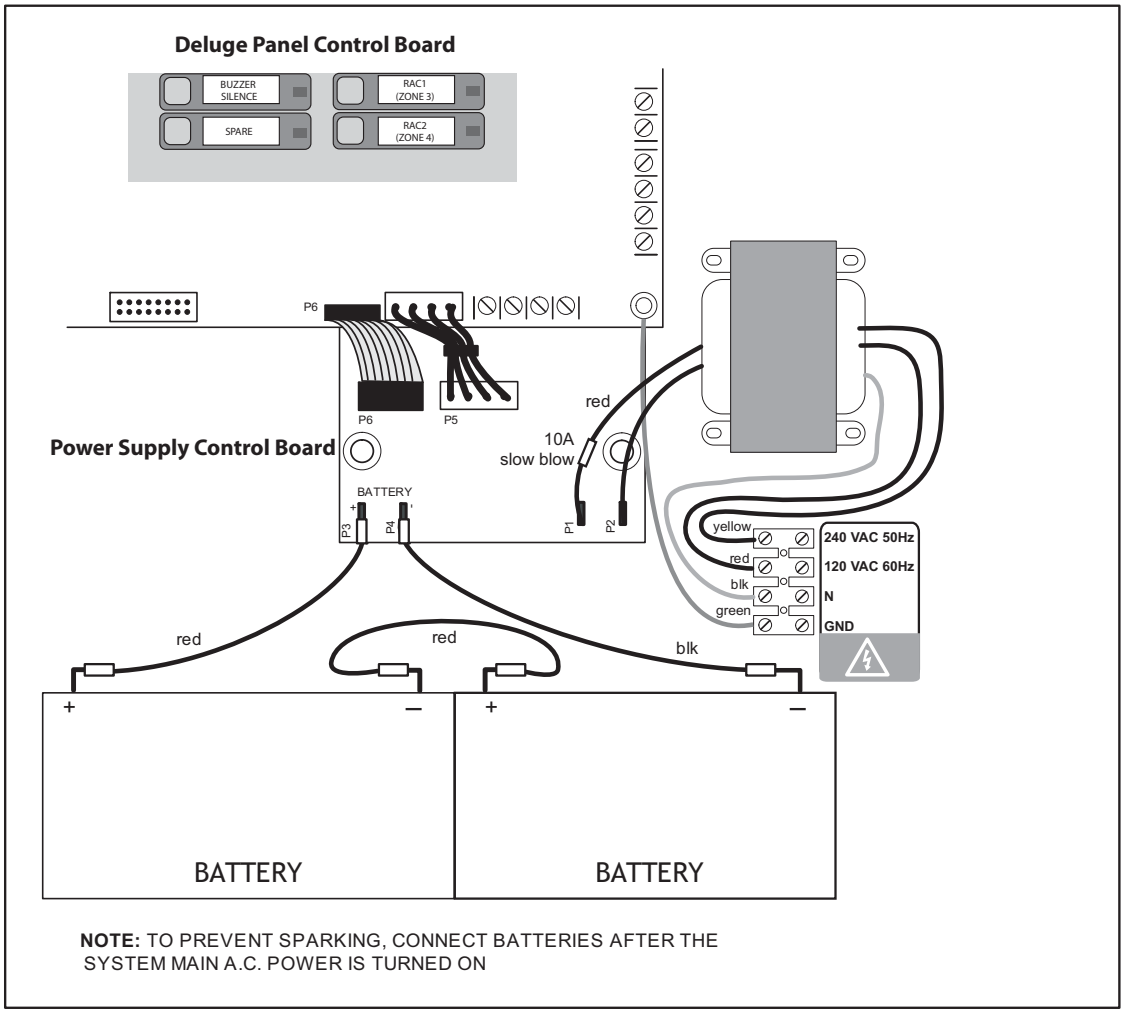


Figure 22 Power Supply Connection

7.7 Wiring Tables and Information

Table 2 Initiating Circuit Wiring Distances

WIRE GAUGE	MAXIMUM WIRING RUN TO LAST DEVICE	
AWG	FEET	METERS
22	2990	910
20	4760	1450
18	7560	2300
16	12000	3600
14	19000	5800
12	30400	9200

Notes: For Class A the maximum wiring run to the last device is divided by two.

Maximum loop resistance should not exceed 100 ohms.

Maximum capacitance of 0.5uF total on each initiating circuit.

Table 3 Indicating Circuit Wiring Distances

TOTAL SIGNAL LOAD	MAXIMUM WIRING RUN TO LAST DEVICE (ELR)								MAX. LOOP RESISTANCE
	18AWG		16AWG		14AWG		12AWG		
Amperes	ft	m	ft	m	ft	m	ft	m	Ohms
0.06	2350	716	3750	1143	6000	1829	9500	2895	30
0.12	1180	360	1850	567	3000	915	4720	1438	15
0.30	470	143	750	229	1200	366	1900	579	6
0.60	235	71	375	114	600	183	950	289	3
0.90	156	47	250	76	400	122	630	192	2
1.20	118	36	185	56	300	91	470	143	1.5
1.50	94	29	150	46	240	73	380	115	1.2
1.70	78	24	125	38	200	61	315	96	1.0

Notes: For Class A wiring the resistance in ohms is multiplied by two.

Maximum voltage drop should not exceed 1.8 volts.

7.8 Four-Wire Smoke Power (regulated)

Four-wire smoke power is provided for four-wire smoke detectors. This filtered supply is supervised therefore a short will disconnect the power and the common trouble is active. The power is reconnected after the 'RESET' key is pressed. See *16.0 Appendix D: Specifications on page 105* for supply rating.

7.9 Supervised Auxiliary Power (regulated)

Supervised auxiliary power is used to power the remote annunciators and smart relay modules. This filtered circuit is supervised therefore a short will disconnect the power and the common trouble is active. The power is reconnected after the 'RESET' key is pressed. See *16.0 Appendix D: Specifications on page 105* for supply rating.

7.10 Unfiltered Supply (full wave rectified)

This regulated supply is not supervised. If there is a short on this circuit, the auxiliary power does not recover automatically when the short is removed. This power supply must be disconnected, then reconnected and the panel reset to re-establish the auxiliary power supply. See *16.0 Appendix D: Specifications on page 105* for supply rating.

8.0 System Checkout

8.1 Before turning the power “ON”

To prevent sparking, **do not connect** the batteries. Connect the batteries after powering the system from the main AC supply.

1. Check that all modules are installed in the proper location with the proper connections.
2. Check all field (external) wiring for opens, shorts, and ground.
3. Check that all interconnection cables are secure, and that all connectors are plugged in properly.
4. Check all jumpers and switches for proper setting.
5. Check the AC power wiring for proper connection.
6. Check that the chassis is connected to **EARTH GROUND** (cold water pipe).
7. Make sure to **close the front cover plate** before powering the system from main AC supply.

The best way to check out a panel first is to not connect any field wiring. Power up the panel with an end of line. The panel should be free of trouble. Then connect one circuit at one time. If a trouble occurs, correct the fault then continue the field wiring.

8.2 Power-up procedure

After completing the System Checkout procedures outlined above,

1. Power up the panel. The "AC ON" green LED and the “Common Trouble” LED should illuminate, and the buzzer should sound. Press the “System Reset” button. Since the batteries are not connected, the trouble buzzer should sound intermittently and the common trouble LED should flash.
2. Connect the batteries while observing correct polarity: the red wire is positive (+) and black wire is negative (-). All indicators should be OFF except for normal power "AC ON" green LED and green LED I4 (below the TROUBLE relay at left bottom of board).

Note: Green LED I4 is illuminated when the system is normal. This LED indicates that the trouble relay is in normal standby condition.

3. Configure the Fire Alarm Control Panel as described in the Configuration section.

8.3 Troubleshooting

Table 4 Troubleshooting

Symptoms	Possible Cause
Circuit Trouble	To correct the fault, check for open wiring on that particular circuit loop or if the Circuit Disconnect Button is active. *Notes: (1) Bypassing a detection circuit or signal circuit will cause a system trouble (off-normal status); (2) Bypassing a releasing circuit will cause a supervisory signal.*
Remote Trouble	Remote Trouble will be indicated on the main panel display for any failure reported by, or failure to communicate with a remote annunciator or other remote device.
Ground Fault	This panel has a **common ground fault detector**. To correct the fault, check for any external wiring touching the chassis or other Earth Ground connection.
Battery Trouble	Check for the presence of batteries and their conditions. Low voltage (below 20.4V) will cause a battery trouble. If battery trouble condition persists, replace batteries as soon as possible.
Common Trouble	If only a common trouble is indicated on the main panel and none of the above confirming trouble indicators are on, check the following for possible fault: • Check for any missing interconnection wiring. • Check for any Module missing that was part of the Configuration. • Check for improperly secured cabling.

9.0 Indicators, Controls and Operations

Refer to *Figure 22* below for LED Indicator and Control Button locations.

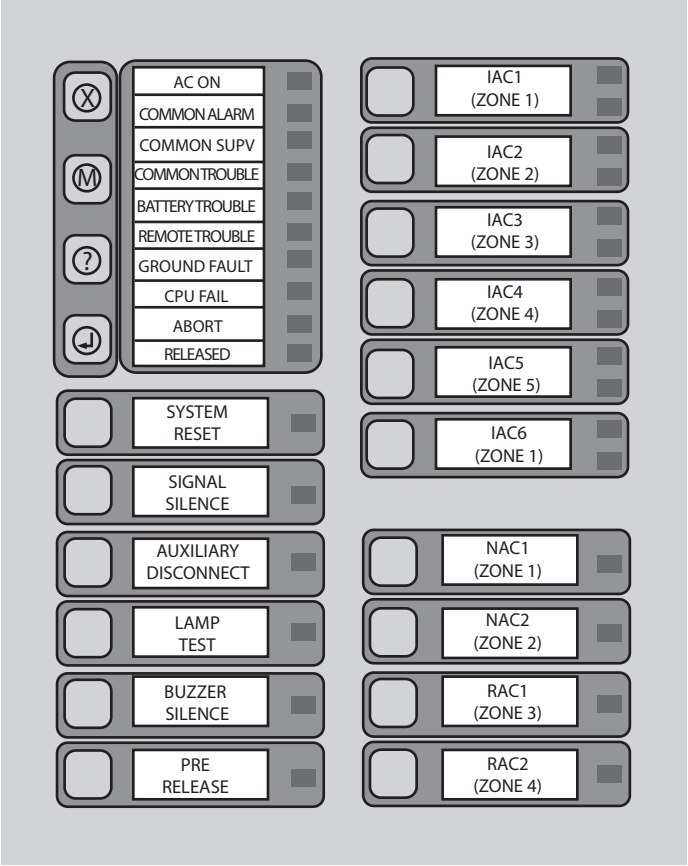


Figure 23 LED indicators and control buttons

The Main Display Panel on the Main Pre-Action/Deluge and Agent Release Control Board consists of:

- 16 common LED Indicators (left portion of display)
- Ten Common Buttons (left half portion of display)
- Up to six Initiating Circuit Alarm LEDs and six Initiating Circuit Trouble LED Indicators
- Four Indicating/Releasing Circuit LEDs (labeled NAC for Notifying Appliance Circuit or RAC for Releasing Appliance Circuit)
- Up to ten disconnect buttons (six for initiating circuits & four for indicating/releasing circuits)

LED Indicators may be amber, red, or green, and may illuminate continuously (steady), or at one of two flash rates.

- Fast Flash (Supervisory)- 120 flashes per minute, 50% duty cycle
- Trouble Flash (Trouble) - 20 flashes per minute, 50% duty cycle

Note: Each display is supplied with laser printer printable paper labels for sliding into the plastic label template on the panel. For the Main Display, the paper label is **Mircom# ND-2056**; this includes English and French versions.

9.1 Common LED Indicators

9.1.1 AC On

The AC ON led is on steady green while the main AC power is within acceptable levels. It is turned off when the level falls below the power-fail threshold.

9.1.2 Common Alarm

The common alarm led is illuminated steady red as a result of any active alarm present in the system.

9.1.3 Common Trouble

The common trouble led in illuminated steady amber as a result of a trouble condition being detected on the system.

9.1.4 Battery Trouble

Flashes amber at a slow rate, when the battery voltage is lower than the specified threshold or the battery is off line. Flashes amber at a fast rate when there is a trouble on the battery charger circuit.

9.1.5 Remote Trouble

Flashes amber at a slow rate as a result of any remote trouble condition.

9.1.6 Ground Fault

Flashes amber at a slow rate when there is a ground fault detected in the system.

9.1.7 CPU Fail

Flashes amber at a slow rate when the CPU is not working properly.

9.1.8 Abort

Illuminate steady amber when the abort circuit is active.

9.1.9 Released

Illuminate steady red when the releasing circuit(s) is active.

9.1.10 System Reset

Turn on steady amber during the system reset process.

9.1.11 Signal Silence

Flashes amber at a slow rate when the signal circuits are silenced.

9.1.12 Auxiliary Disconnect

Flashes amber at a slow rate when the auxiliary disconnect function is active.

9.1.13 Lamp Test

Illuminate amber steady when the lamp test button is pressed.

9.1.14 Buzzer Silence

Flashes amber at a slow rate when the buzzer is silenced.

9.1.15 Pre Release

Flashes red at a fast rate, when the release timer is started turns off when the release timer expires or the system is reset.

9.2 Menu Buttons

To use the menu buttons you will need to install the CFG-300 configuration tool. See *Using the CFG-300 Tool* on page 48 31 for details.

Menu Button

Menu Button	Pressing Ⓜ and entering the passcode will allow you to enter the command menu.
Info Button	When the system is off-normal, press ⓘ to display extra information of the event.
Enter Button	Pressing this button to select a menu option or to confirm a menu operation.
Cancel Button	To return to previous menu in the configuration or command mode.

9.3 Switches and Common Indicators

The FR-320 Series panel is a six-zone panel with four output circuits. The circuits are arranged in the following configuration:

Zone 1	Input circuit
Zone 2	Input circuit
Zone 3	Input circuit
Zone 4	Input circuit
Zone 5	Manual Release/Abort switches combination or individual switch
Zone 6	Manual Release/Abort switches combination or individual switch
Out 1	NAC1
Out 2	NAC2
Out 3	Releasing circuit 1
Out 4	Releasing circuit 2 or NAC3 in some applications

9.3.1 Zone 1 to Zone 4

- Alarm LED (red) turns on steady when an alarm is detected
- Supervisory LED (amber)turns on steady when the circuit is active
- Trouble LED (amber)turns on at slow flash rate when in trouble or bypassed

9.3.2 Zone 5 and Zone 6

- Alarm LED & Trouble LEDThe zone type and LED behavior varies upon the configuration. Steady when turned on.

9.3.3 Out1 and Out2 (NAC circuits)

- Trouble LED (amber)turns on at slow flash rate when in trouble or bypassed

9.3.4 Out3 and Out4 (Releasing circuits)

- Trouble LED (amber)turns on steady when the circuit is bypassed
  turns on at slow flash rate when in trouble

9.3.5 Input Circuits Bypass Switch

These bypass switches are used to bypass the input circuit. Bypass is a toggle switch which will bypass and un-bypass in a sequence whenever the switch is pressed. When the input circuit is bypassed a trouble is generated and the system will not respond to any trouble or alarm on the bypassed input circuit. If the bypassed input circuit is active and the Bypass Switch is pressed for un-bypassing, the Alarm LED will flash at the fast rate for 10 seconds. During these 10 seconds, pressing the Bypass Switch can bypass the active input circuit again. After 10 seconds, the bypassed alarm will be processed.

9.3.6 Output Circuits Bypass Switch

The output circuit bypass switches bypasses the NAC circuit and the releasing circuit. The switch is a toggle switch and pressing it again, will un-bypasses the output circuit the trouble LED turns off.

9.4 Common Controls

9.4.1 System Reset Button

The System Reset button resets the Fire Alarm Control Panel and all Circuits. In particular, the system reset button

- Resets all Latching Trouble Conditions
- Resets all Initiating and Releasing Circuits
- Resets 4-Wire Smoke Supply
- Turns off all Indicating Circuits
- Turns off Signal Silence Indicator
- Stops and resets all Timers
- Processes inputs as new events
- Does not affect Aux Disconnect

9.4.2 Signal Silence Button

Activation of the Signal Silence button when the panel is in alarm turns on the Signal Silence indicator and deactivates any Silenceable Indicating Circuits. Non-Silenceable Circuits are unaffected. Signals will re-sound upon any subsequent alarm. Subsequent operation of signal silence resounds all Silenceable signals. This button does not function during any configured Signal Silence Inhibit Timer period.

9.4.3 Auxiliary Disconnect Button

Activating the Auxiliary Disconnect button activates the Auxiliary Disconnect function. The Auxiliary Alarm Relay is always disconnected with this button. The Common Alarm Relay, the Common Supervisory relay and all correlated alarm relays may be disconnected as selected through configuration. Activating the Auxiliary Disconnect button also causes the Common Trouble LED to illuminate steady, the common trouble relay to send a trouble message and

the trouble buzzer to flash at the trouble flash rate. Pressing the Auxiliary Disconnect button again de-activates this function and the system will go back to normal.

9.4.4 Lamp Test Button

Activation of the Lamp Test button causes all front panel Indicators to steadily illuminate and turns the buzzer ON steady. If Lamp Test is active for more than 10 seconds, Common Trouble is activated.

9.4.5 Buzzer Silence Button

Activation of the Buzzer Silence button while the Buzzer is sounding silences the Buzzer. The Buzzer will resound if there is a subsequent event. Pressing the button when the Buzzer is not sounding has no effect.

9.5 Circuit (zone) disconnect buttons

Circuit (Zone) Disconnect pushbuttons are provided for all initiating indicating, and releasing circuits on the Fire Alarm Control Panel. These pushbuttons are located beside their respective indicating LED.

Pressing a Circuit Disconnect pushbutton bypasses the associated circuit and turns on its Trouble Indicator, activating Common Trouble. Pressing a releasing circuit disconnect pushbutton bypasses the associated releasing circuit and turns on its LED, activating common supervisory. While a Circuit is disconnected, all changes in status (alarms and troubles) on that circuit are ignored. The panel does not activate disconnected indicating circuits. Circuit Disconnect pushbuttons are toggle switches; therefore, pressing an activated switch a second time will un-bypass (reconnect) the circuit.

Disconnecting an active Latching Initiating Circuit (including Alarms, Water flow Alarm, Sprinkler Alarm, General Alarm, and Latching Supervisory) does not affect its status until the panel is reset. Disconnecting an active Non-Latching Initiating Circuit (including Non-Latching Supervisory and Trouble-Only) causes them to behave as if the alarm situation has disappeared. Disconnecting an active indicating circuit immediately deactivates the circuit.

When an Initiating Circuit Disconnect pushbutton is returned to the normal state (by pressing it again in order to un-bypass the circuit), the panel checks the state of the circuit. If the circuit is active, the Status Indicator flashes for 10 seconds at the Fast Rate without processing the input. If the Circuit is not re-bypassed by then, it will be processed as a new input.

9.6 Common Relays

Table 5 Relay Types

Relay Type	Single Hazard	Dual Hazard
Trouble Relay	Trouble	Trouble
Supervisory Relay	Supervisory	Supervisory
Alarm Relay	Alarm	Hazard1 (Alarm)
Aux Alarm Relay	Alarm (Silence-able)	Hazard2 (Alarm)

Note: Some troubles are latching once they are detected they remain active until system reset. In this case the common trouble indicator will also remain active until system reset. The common trouble is not bypassed by the auxiliary disconnect function.

9.7 Circuit Types

9.7.1 Initiating (Detection) Circuit Types

9.7.2 Non-Verified Alarm

A Non-Verified alarm is a “normal” type of alarm that can have pull stations, smoke detectors, or heat detectors attached to it. Activation of any of these devices will immediately result in an alarm condition in the Fire Alarm Control Panel. An Alarm condition causes the associated Circuit Status LED and the Common Alarm LED to illuminate red.

9.7.3 Water Flow Alarm (Water flow Sensors)

Water Flow Alarms are identical to normal Non-Verified Alarms except that any indicating circuits programmed to these circuits (all are by default) are Non-Silenceable. Also, if Water Flow Retard Operation is enabled, these circuits are sampled every one second. If ten samples are active within any 15-second interval, the Water flow Alarm is confirmed and processed. An alarm condition causes the associated Circuit Status LED and the Common Alarm LED to illuminate red.

Note: Do not use Retard Operation with any external retarding device; maximum retard may not exceed 120 seconds.

9.7.4 Non-Latching Supervisory (For Supervisory Circuits)

Activation on these circuits will cause the Circuit Status LED and the amber Common Supervisory LED to illuminate. The buzzer will sound at fast rate. If the circuit activation is removed, the Supervisory condition will clear (as long as there are no other Supervisory conditions in the system) and the Circuit Status LED will turn off.

9.7.5 Latching Supervisory (For Supervisory Devices)

Activation on these circuits will cause the Circuit Status LED and the amber Common Supervisory LED to illuminate. The buzzer will sound at fast rate. If the circuit activation is removed, the Supervisory condition will NOT clear.

9.7.6 Abort Switch

When the hazard area is in alarm (pre-discharge) state and the release timer is running, the activation of the corresponding Abort Switch will pause the releasing timer. The release process is held while the Abort Switch is pressed. Releasing the Abort Switch will resume the releasing timer and the corresponding hazard area goes into Alarm (pre-discharge) state again. The value of the release timer after Abort Switch is released depends on the type of Abort Delay in the configuration. When the release timer expires, the corresponding releasing circuit is activated. When the panel is in normal condition, activation of the Abort Switch will cause a trouble signal and the corresponding zone amber LED turns on at slow flash rate.

9.7.7 Manual Release Switch

Activation of the Manual Release Switch of a hazard area will activate the corresponding releasing circuit. If the corresponding Manual Release Delay is non-zero, the releasing circuit will be activate after the Manual Release Delay expires.

9.7.8 Combination of Abort Switch and Manual Release Switch

This type of circuit is the combination of both Abort Switch and Manual Release Switch. This combination always applies to the same hazard area. A short condition on the circuit is a Manual Release Active and a current limit condition is an Abort Switch Active.

9.7.9 Indicating (Signal) Circuits Types

9.7.10 Silenceable Signal

The Silenceable Signal circuit is used for audible devices such as bells and piezo mini-horns that may be silenced either manually or automatically.

9.7.11 Non-Silenceable Signal

The Non-Silenceable Signal Circuit is used for audible devices such as bells and piezo mini-horns that may **not** be silenced either manually or automatically. While sounding, these devices follow the evacuation code pattern that is configured by the user. For more information on evacuation codes, refer to *Evacuation Codes* on page 47.

9.7.12 Silenceable Strobe

Silenceable strobes will be silenced when the “signal silence” key is pressed.

9.7.13 Non-Silenceable Strobes

Non-Silenceable Strobes will not be silenced when the “signal silence” key is pressed.

9.8 Evacuation codes

Continuous	On 100% of the time
Temporal Code	3 of 0.5 second on, 0.5 second off then, 1.5 second pause
20 BPM	1.5 seconds on, 1.5 seconds off
60 BPM	0.5 second on, 0.5 second off
120 BPM	0.25 second on, 0.25 second off

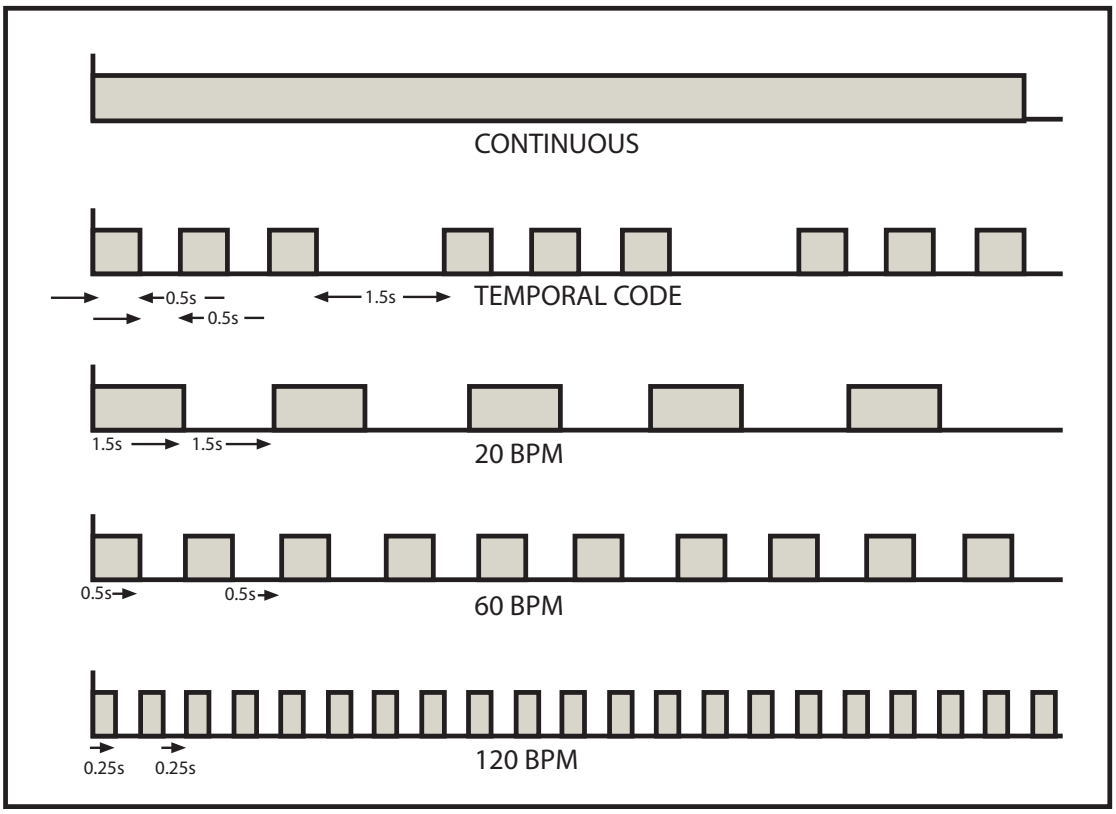


Figure 24 Evacuation and Alert Codes

10.0 Configuration

Configure the FR-320 Series Panels using the CFG-300 LCD Tool (see further documentation packaged with CFG-300 for configuration information).

10.1 Using the CFG-300 Tool

Connect the CFG-300 to the panel, then press (Menu button). The CFG-300 LCD display will display the Main Menu. The function of different buttons on the front panel display is shown in *Figure 22* below.

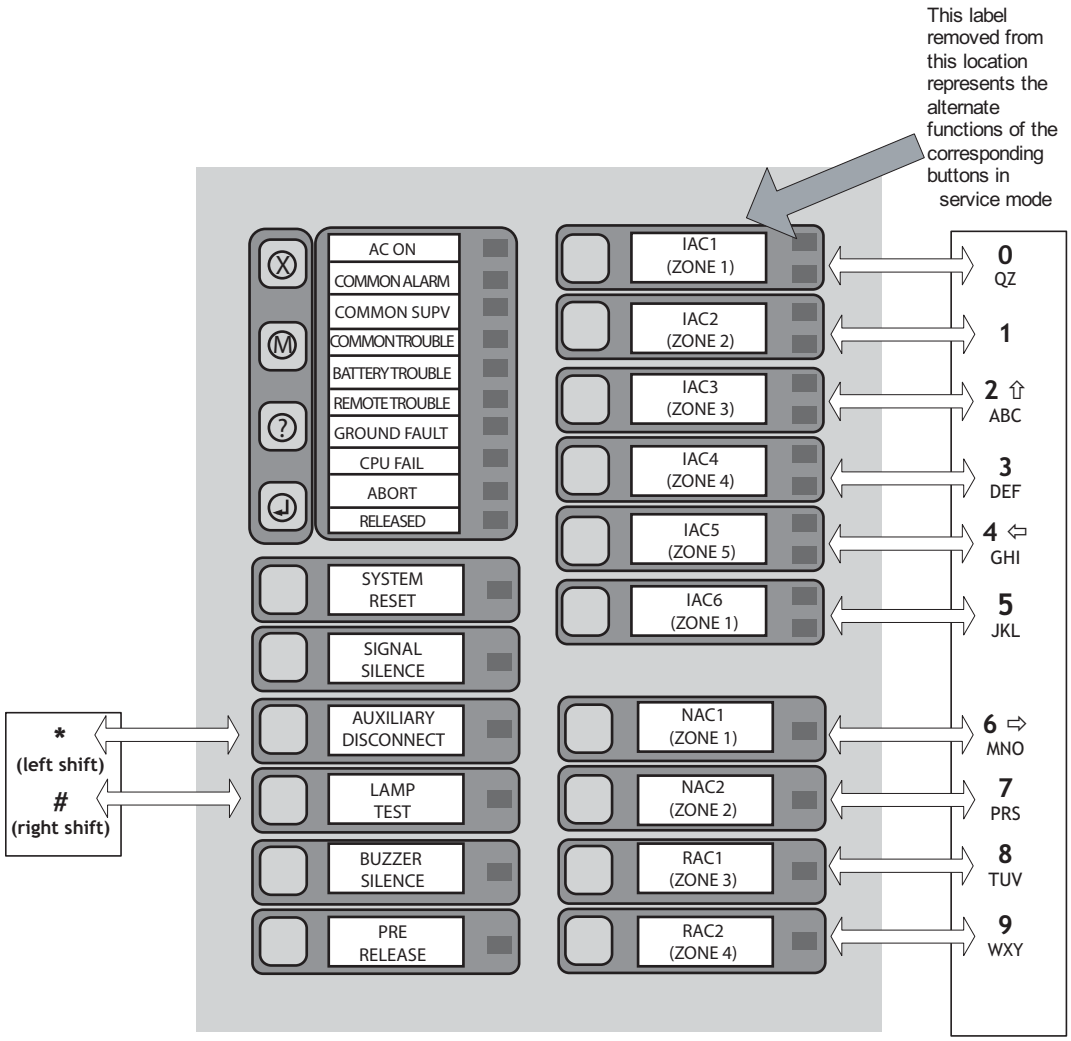


Figure 25 FR-320 Configuration

10.2 Entering the Passcode

The programming section is passcode protected. The following screen shows the message that is displayed to enter the passcode. The maximum allowable passcode is ten digits long, and permits numerical values only. Press (Enter button) after entering the passcode. If the passcode is correct, it will take you to the main command menu. If the passcode is wrong

the system will ask you to re-enter passcode. The system will be exhausted after three retries and will then take you back to the Normal message display.

When the user presses “MENU” and enters the password, they should enter the password of the level intended. If the user is in a lower level of access, attempts to operate functions requiring a higher level of access will be refused. The three levels of access are defined in Table 6.

Table 6 Access Levels

Access Level	Description
Level 0 - Command	The default password is for this level “1111” without quotes. In this level the user can only perform regular testing and operation.
Level 1 - Configuration	The default password is for this level “2222” without quotes. User can change configuration and have access to command level.
Level 2 - Factory	Currently not used.

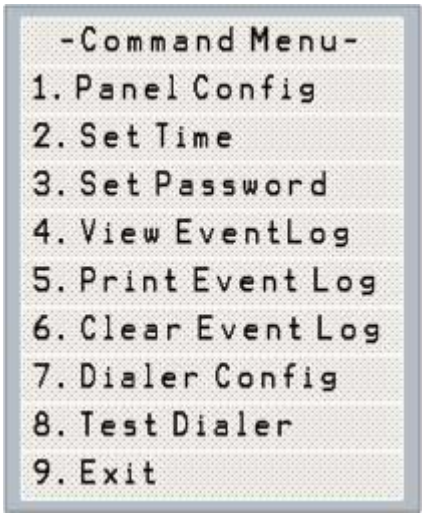
10.3 How to Use the Keypad to Program the FR-320

1. Press (Menu button). You will be prompted to enter your password.
2. Enter your password, then press (Enter button) to continue.
3. Select a Command Menu option by pressing . The corresponding submenu will display.
4. Use the up and down arrow buttons to scroll through the submenu.
5. Press to select a submenu option.
6. Use the left or right arrow buttons to select/unselect an option (selected = “X”). Use the up and down arrows to scroll through the different menu options. When entering numerical data, use the up and down arrows to increase or decrease the number.
7. Once you have made the correct selection, press to confirm the change. The display will return to the submenu screen.
8. Press (Cancel button) to return to the previous menu.

10.4 Command Menu

The main command menu is pictured below. The first line of the LCD will always show "-Command Menu-", and the second line scrolls through different selections. Use the "UP" and "DOWN" keys to scroll through the menu, and press the ↵ key to make a selection. To exit from the main command menu, select the "Exit" menu option and then press either the ⓧ or ↵ key.

Note: Command Menu Item 1 and 6 can only be accessed if jumper JW6 is placed on the main board.



Access level Required
Configuration
Configuration
Configuration
Command
Command
Command
Configuration
Command
Command

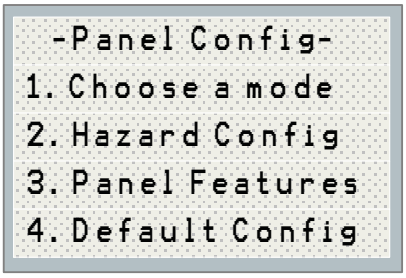
Pressing "LAMP TEST" at any time will show the information about the system and the software version as shown below.

The first line shows the panel mode number, pre-programmed mode and the information if the panel has a dialer or not. The second line shows the software version number. The version of the software is read as Major.Minor.Revision.

10.5 1. Panel Config (Command-Menu)

The following is a detailed description of the FR-320 configuration menu.

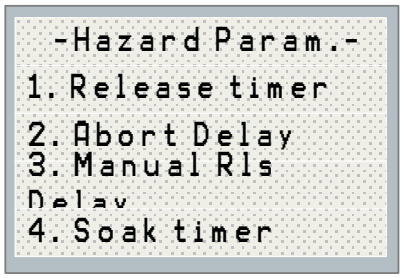
Note: Refer to *10.3 How to Use the Keypad to Program the FR-320 on page 49* for detailed instructions on making menu selections.



10.5.1 Command Menu-->Panel Config-->Choose a mode

Command Menu-->Panel Config--> Choose a mode **1. Choose a mode** 	1-->Default	Use this function to choose a pre-programmed panel configuration. Selections range from modes 1 to 14. Refer to *Pre-Programmed Modes* on *12.0 Pre-Programmed Modes on page 70* for details on mode configurations. **Note: changing the fixed configuration of the panel will cause all configuration data set to default for that particular mode.**

10.5.2 Command Menu-->Panel Config-->Hazard Config

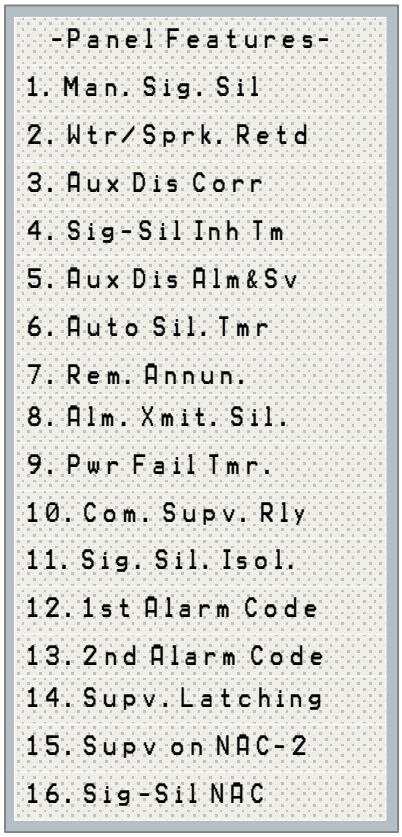


Note: Refer to *10.3 How to Use the Keypad to Program the FR-320 on page 49* for detailed instructions on making menu selections.

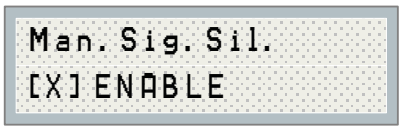
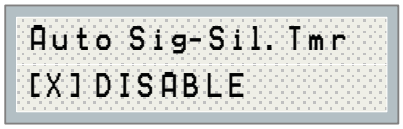
Command Menu-->Panel Config--> Hazard Config **1. Release Timer** 	60->Default Available options: 0,5,10,15,20,25,30,35,40, 45,50,55,60 seconds	Use this function to set the programmable timer that delays the activation of the releasing application circuits. This timer starts immediately after receiving a confirming alarm (cross-zoned hazard area) or a single alarm (non-cross-zoned hazard area). When the timer expires, the releasing circuit activates. Value: 0 to 60 seconds in five-second increments.
Command Menu-->Panel Config--> Hazard Config **2. Abort Delay** 	[X] Standard UL->Default [ ] IRI [ ] NYC [ ] Local Juris.	Use this function to set how the Abort Switch operates with the Release Timer. Note that if the Release Timer is set to zero, the Abort Switch does not operate. In **Standard UL** mode, the release timer will stop and hold when the Abort Switch is pressed. When the switch is released, the Release Timer restarts from whichever is greater: the remaining time on the timer or 10 seconds. In **IRI** mode, the switch works in the same way as it does in Standard UL mode, except that the switch will function only if it is pressed and held before the second alarm comes in. In **NYC** mode, pressing the Abort Switch will reset to the Release Timer and add 90 seconds to the configured timer duration. After the Abort Switch is released, the Release Timer will restart. In **Local Juris.** (Local Jurisdiction Delay), pressing the Abort Switch will reset the Release Timer back to its configured value. After the switch is released, the Release Timer will restart.

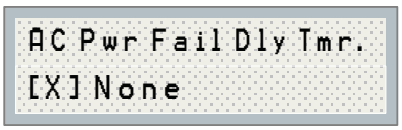
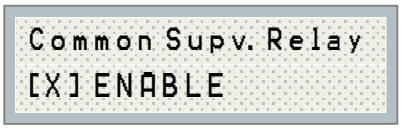
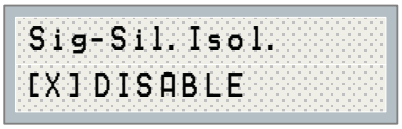
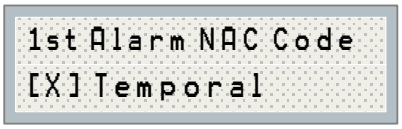
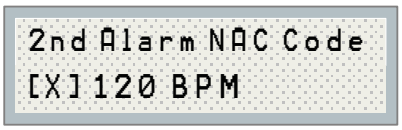
Command Menu-->Panel Config--> Hazard Config **3. Man. Rls Delay** 	0->Default Available options: 0, 5, 10, 15, 20, 25, 30 seconds	Use this function to set the time delay of activation of corresponding releasing circuit(s) after activation of the manual release switch. Value: 0 to 30 seconds in five-second increments.
Command Menu-->Panel Config--> Hazard Config **4. Soak timer** 	0->Default (continuous) The selectable values are in seconds: 0, 10, 20, 30, 40, 50, 60, 120(2min), 180(3min), 240(4min), 300(5min), 360(6min), 420(7min), 480(8min), 540(9min), 600(10min), 660(11min), 720(12min), 780(13min), 840(14min), 900(15min)	Use this function to set the length of time for which the releasing circuit is active. When the soak timer expires, the control panel automatically shuts off the activated releasing circuit. 0 seconds means that the soak timer is disabled and the releasing circuit is active continuously.

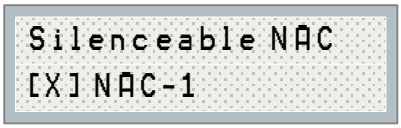
Command Menu-->Panel Config-->Features



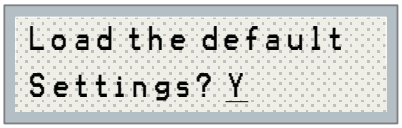
Note: Refer to *10.3 How to Use the Keypad to Program the FR-320 on page 49* for detailed instructions on making menu selections.

Command Menu-->Panel Config-->Features **1. Manual Sig. Silence** 	[X] ENABLE ->Default [ ] DISABLE	Use this function to enable or disable the Signal Silence operation on the panel.
Command Menu-->Panel Config-->Features **2. Wtr/Sprk. Retd** 	[ ] ENABLE [X] DISABLE->Default	By default all the initiating circuits configured as waterflow or sprinkler act as non-verified alarms. If enabled, a retard operation is performed for initiating circuits configured as waterflow or sprinkler.
Command Menu-->Panel Config-->Features **3. Aux Dis Corr** 	[X] ENABLE ->Default [ ] DISABLE	By default this function will disconnect the auxiliary alarm relay when the aux disconnect button is pressed. If enabled, this function will disconnect the auxiliary alarm relay *and* all correlated relays when the aux disconnect button is pressed. **Correlated relays include: RM-306 and SRM-312.**
Command Menu-->Panel Config-->Features **4. Sig-Sil Inh Tmr** 	[X] DISABLE->Default [ ] 10sec [ ] 20sec [ ] 30sec [ ] 1min	Use this function to inhibit the signal silence switch for a desired length of time. The time period should expire before the signals may be silenced. According to the Canadian National Building Code, this timer should be set to one minute.
Command Menu-->Panel Config-->Features **5. Aux. Dis. Dis Alam&Sv** 	[ ] ENABLE [X] DISABLE->Default	If enabled the Common Alarm and Common Supervisory relays will be disconnected when Aux. Disconnect is pressed. Also, the PR-300 will not transmit a supervisory or alarm event.If disabled, the Aux disconnect switch has no effect on the Common Alarm relay, the Common Supervisory relay, and the PR-300.
Command Menu-->Panel Config-->Features **6. Auto Sig-Sil. Tmr** 	[X] DISABLE->Default [ ] 5 Min [ ] 10 Min [ ] 20 Min [ ] 30 Min	Use this function to set the time period for which the indicating circuits will sound before they are automatically silenced. According to the Canadian National Building Code, this timer should not be set to less than 20 minutes.
Command Menu-->Panel Config-->Features **7. Rem. Annun.** 	[X] NONE->Default [ ] 1 [ ] 2 ... [ ] 6	Use this function to program the number of remote annunciators. Any combination of remote annunciators or smart relays can be used as long as the number does not exceed 6. The annunciators' addresses should be linear: without gaps and in sequence.

Command Menu-->Panel Config-->Features **8. Alarm Xmit-Sil.** 	[ ] ENABLE [X] DISABLE->Default	Use this function to allow the alarm transmit and auxiliary alarm relay to reset on the Signal Silence rather than the Reset switch.
Command Menu-->Panel Config-->Features **9. Pwr Fail Tmr** 	[X] NONE->Default [ ] 1 HRS [ ] 3 HRS	Use this function to delay the reporting of AC power fail trouble for a specific time period. If disabled, the AC power fail will be reported immediately.
Command Menu-->Panel Config-->Features **10. Com. Supv. Rly** 	[X] ENABLE->Default [ ] DISABLE	If disabled, the common supervisory relay can be used as a common alarm relay. It will act the same way as a common alarm relay. If enabled, it is used as a common supervisory relay.
Command Menu-->Panel Config-->Features **11. Sig-Sil. Isol.** 	[ ] ENABLE [X] DISABLE->Default	Enable this function only when suite isolators are used (Canada only).
Command Menu-->Panel Config-->Features **12.1st Alarm NAC Code** 	[X] Temporal ->Default [ ] 20 BPM	Sets the NAC indicating code when the 1st alarm comes in.
Command Menu-->Panel Config-->Features **13. 2nd Alarm NAC Code** 	[X] 120 BPM->Default [ ] 60 BPM [ ] Temporal	Choose the NAC indicating code when the 2nd alarm comes in.
Command Menu-->Panel Config-->Features **14.Supv. Latching** 	[ ] Latching [X] Non-latching->Default	Use this function to set the supervisory circuit as either latching or non-latching. NOTE: For ULC operation the supervisory should be programmed as latching
Command Menu-->Panel Config-->Features **15. Supv on NAC-2** 	[ ] ENABLE [X] DISABLE->Default	Use this function to enable/disable the supervisory circuit indication on NAC-2.

Command Menu-->Panel Config-->Features **16. Sig-Sil NAC** 	[X] NAC-1->Default [X] NAC-2->Default	Use this function to set which NAC circuits are silenceable or non-silenceable.
Command Menu/FR-320 Config/Features/ **17. Active EOL** 	[X] DISABLE->Default [ ] ENABLE	Enable this function if using an Active EOL. If ICAC-306 is used, this function should be enabled since the Class A Converter has built in Active EOL resistors.

10.5.3 Command Menu-->Panel Config-->Default Config

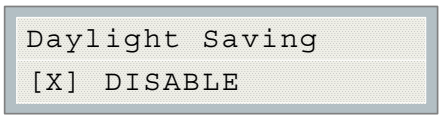
Command Menu-->Panel Config--> Default Config **4. Default Config** 	Y-->Default	Use this function to reset the panel to the default configuration of the chosen programming mode.

10.6 2. Set Time (Command-Menu)

Note: Refer to *10.3 How to Use the Keypad to Program the FR-320 on page 49* for detailed instructions on making menu selections.

Command Menu/Set time Date

1. Daylight saving time

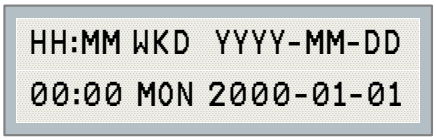


[X] DISABLE ->Default
[ ] ENABLE

Use this function to enable daylight savings time.

Command Menu/Time Clock

2. Set time and date



Default
00:00 MON 2000-01-01

Use this function to set the time and date. Use the “LEFT” and “RIGHT” keys to move the cursor to the desired location in the display and use the “UP” and “DOWN” keys to increase or decrease the values. Press the “ENTER” key to accept the changes and the “CANCEL” key to ignore the changes.

Note: time is in 24hr format

Command Menu/Time Clock

2. Compensation

Default: 0 seconds (no compensation)

Compensation values can range from -15 to +15 seconds.

Use the up down arrow keys to select daily compensation value and press ENTER. For a fast clock adjust negatively. For a slow clock adjust positively. For example: for a clock which runs 5 minutes a month (based on 30 days) fast select -10 seconds.

When value is entered the following message will appear

- 3. Set password (Command-Menu)

First choose the level of password to be changed

Then

0 -> Default

Use this function to change the passcode. The minimum number of digits is 4 and the maximum is 10. Only numeric digits are allowed.

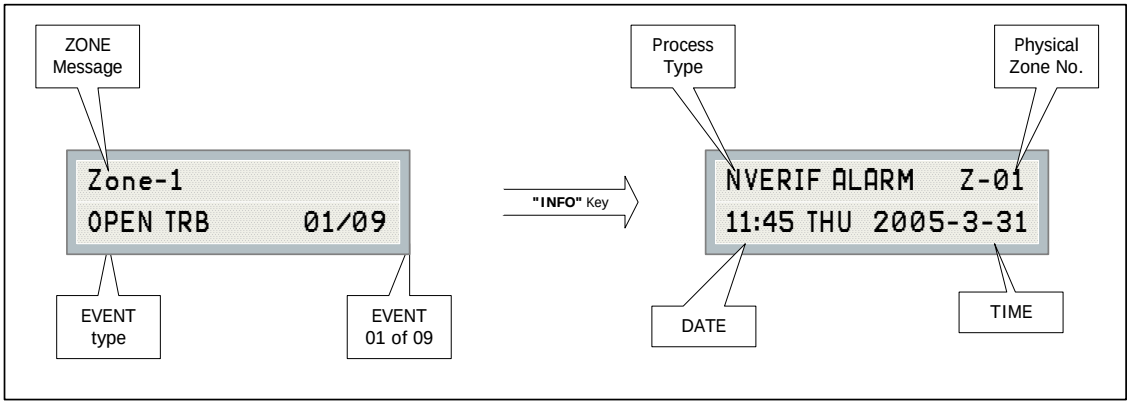
If the passcode does not match, the following message appears and the system exit to the main menu

If the passcode is OK the following message appears and exits to the main menu

The user can change the password only for the current access level as well as any lower levels.

10.7 4. View Event Log (Command-Menu)

The event log looks the same as the normal event queue. Pressing the “INFO” key has the same effect that it does in the event queue. The illustration below provides an example of how the “INFO” key works and shows the CFG-300 LCD Configuration tool display.



There are a maximum of 200 recent events saved in the event log. If the number of events goes beyond 200, the oldest event is overwritten by the most recent one.

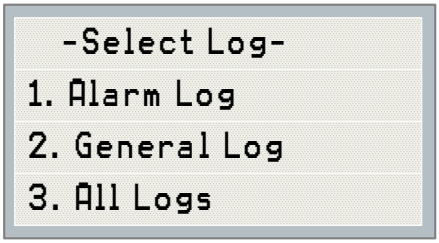
10.8 5. Print Event Log

Use this function to print the Alarm or General log.

Select the type of log to print. Press the “ENTER” key. The system will then print the requested log

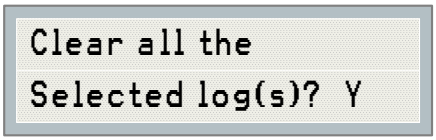
10.9 6. Clear Event Log (Command-Menu)

Note: Refer to *10.3 How to Use the Keypad to Program the FR-320 on page 49* for detailed instructions on making menu selections.



Select the type of log to clear. Press the “ENTER” key. The system will then confirm before clearing logs.

Use this function to clear alarm logs, event logs, or both.

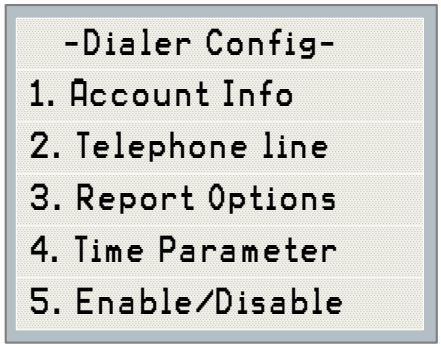


Press the “ENTER” key to confirm or the “CANCEL” key to cancel the operation.

10.10 7. Dialer Config (Command-Menu)

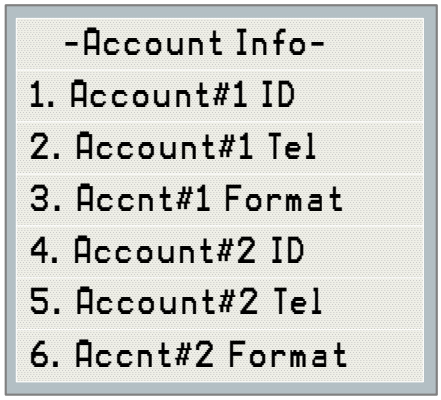
Note: Refer to *10.3 How to Use the Keypad to Program the FR-320 on page 49* for detailed instructions on making menu selections.

The following illustration shows the dialer configuration menu. This menu will show up only if there is a built-in dialer on the main board. Each item in this menu is described below in detail.



Command Menu-->Dialer Config

10.10.1 Account Info



Command Menu/Dialer Config/Account Info

1.Account# 1 Identification

`123456->Default`

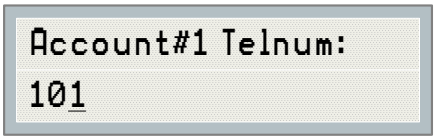
Use this function to set the Account ID for the monitoring station to which the dialer reports events. The maximum # of digits allowed is six. For contact ID, only the first four digits are used; the last two are truncated.

If you are using contact ID the allowed digits for the account ID are simple digits 0 to 9 and hexadecimal digits A to F (the SIA protocol only allows digits 0 to 9).

To enter hexadecimal digits, press the INFO button. The letter “A” will appear. To scroll through the rest of the letters, press INFO repeatedly. Press # to move the cursor to the right or press * to move it to the left.

Command Menu/Dialer Config/Account Info

2.Account#1 Telephone Number

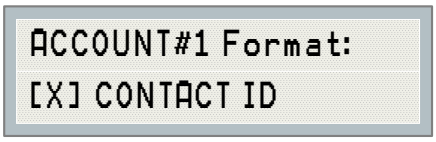


`[101]->Default`

Use this function to set the telephone number of the monitoring station. The maximum # of digits allowed is 19 including “,” and numerals. The “,” will be treated as 1 sec delay. To enter “,” press the INFO button. Press # to move the cursor to the right or press * to move it to the left. An example of a typical telephone # is 9,,12345678.

Command Menu/Dialer Config/Account Info

3.Account#1 Reporting Format

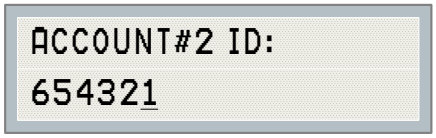



```
[X] CONTACT ID-Default
[ ] SIA 300 Baud
[ ] SIA 110 Baud
```

Set the reporting format that is recognized or preferred by the monitoring station.

Command Menu/Dialer Config/Account Info

4. Account# 2 Identification

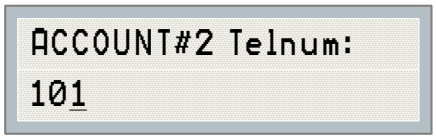



```
654321->Default
```

Same as Account#1.

Command Menu/Dialer Config/Account Info

5.Account# 2 Telephone Number

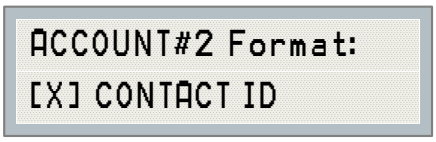



```
[ 101 ]->Default
```

Same as Account#1.

Command Menu/Dialer Config/Account Info

6.Account# 2 Reporting Format



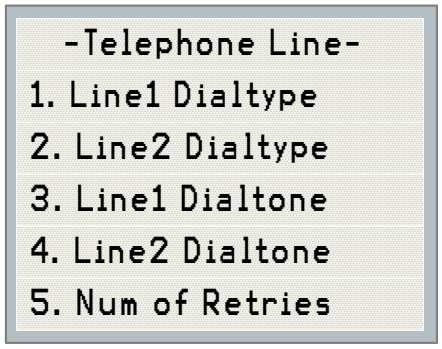

```
[X] Contact ID-Default
[ ] SIA 300 Baud
[ ] SIA 110 Baud
```

Same as Account#1.

Command Menu-->Dialer Config

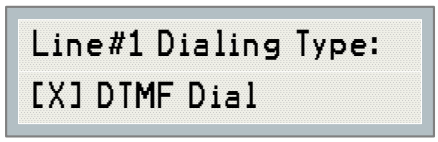
Note: Refer to *10.3 How to Use the Keypad to Program the FR-320 on page 49* for detailed instructions on making menu selections.

10.10.2 Telephone Line



Command Menu/Dialer-Config/Telephone Line

1. Line#1 Dialing Type

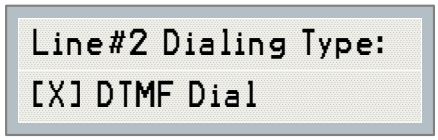



```
[X] DTMF Dial->Default
[ ] Pulse Dial
```

Set the dialing type for line #1; this is the type recognized or preferred by the telephone company.

Command Menu/Dialer-Config/Telephone Line

2. Line#2 Dialing Type




```
[X] DTMF Dial->Default
[ ] Pulse Dial
```

Same as Line#1.

Command Menu/Dialer-Config/Telephone Line

3. Line#1 wait for Dial tone

```
[X] ENABLE ->Default
[ ] DISABLE
```

Use this function to let the system know whether or not to wait for a dial tone before dialing. Cell phone setup for the dialer requires that the system not wait for dial tone before dialing.

Command Menu/Dialer-Config/Telephone Line

4.Line#2 wait for Dial tone

```
[X] ENABLE ->Default
[ ] DISABLE
```

Same as Line#1.

Command Menu/Dialer-Config/Telephone Line

5.Number of retries

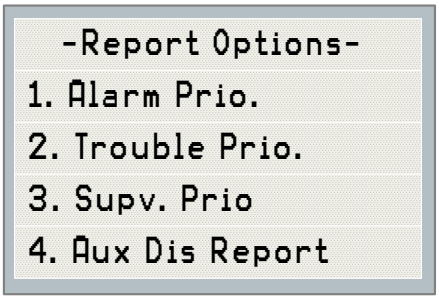
```
06 ->Default
Number of retries
ranges between 5 to 10
```

Set the number of retries for both line#1 and line#2. This function lets the dialer retry on either line if it is busy or not available. If the retry count expires, the panel reports a line trouble.

Command Menu-->Dialer-Config

Note: Refer to *10.3 How to Use the Keypad to Program the FR-320 on page 49* for detailed instructions on making menu selections.

10.10.3 Report Options



Command Menu/Dialer-Config/Report Options

1. Alarm Report priority

```
[X] Account 1->Default
[ ] Account 2
```

Use this function to set the account priority for reporting alarms. If the priority is set for account#1 then the dialer will try account#1 first for reporting.

Command Menu/Dialer-Config/Report Options

2.Trouble priority

```
[X] Account 1->Default
[ ] Account 2
```

Use this function to set the account priority for reporting trouble. If the priority is set for account#1 then the dialer will try account#1 first for reporting.

Command Menu/Dialer-Config/Report Options

3. Supervisory priority

```
[X] Account 1->Default
[ ] Account 2
```

Use this function to set the account priority for reporting supervisory troubles. If the priority is set for account#1 then the dialer will try account#1 first for reporting.

Command Menu/Dialer-Config/Report Options

4. Aux Disc Alm/Supv Rpt.

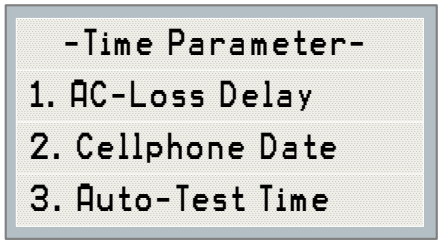
```
[ ] ENABLE
[X] DISABLE ->Default
```

If this function is enabled, the Aux Disconnect feature (obtained by pressing the Aux Disconnect button) will block the alarm and supervisory events from being reported through the built-in dialer.

Command Menu-->Dialer-Config

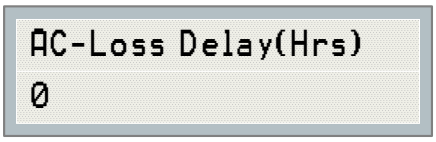
Note: Refer to *10.3 How to Use the Keypad to Program the FR-320 on page 49* for detailed instructions on making menu selections.

10.10.4 Time Parameters



Command Menu/Dialer-Config/Time Parameter

1. AC Loss delay




```
0 ->Default
The AC loss delay
ranges from 0 to 20
hours
```

Use this function to delay the reporting of AC loss trouble on the dialer for the programmed time period. Press UP or DOWN button to increase or decrease the number of hours.

Command Menu/Dialer-Config/Time Parameter

2. Cellular report date

```
0 ->Default
The cellular report
date ranges from 0 to
28
```

Use this function to set the test report date for the cell phone setup. If the date is set to 0, this means there is no test reporting for cell phone or the phone line is a regular line. Other settings could be anywhere from 01-28, representing which day of the month the test should be performed. Press the UP or DOWN buttons to scroll through the days.

Command Menu/Dialer-Config/Time Parameter **3. Auto test time** Auto-Test (HH:MM): 00:30	00:30 ->Default	Use this function to set the time for auto test. This test has to be performed once a day to send the test report to the monitoring station. The time is in 24hr format, which means 00:30 is 30 minutes after mid-night. Press the UP or DOWN buttons to increase or decrease the time. **Please do not use the following test times: 00:00, 01:55, 02:00 and 03:00.**

Command Menu-->Dialer-Config

Note: Refer to *10.3 How to Use the Keypad to Program the FR-320 on page 49* for detailed instructions on making menu selections.

10.10.5 Dialer Enable/Disable

Dialer Ena/Dis [X] ENABLE	[X] ENABLE ->Default [ ] DISABLE	The dialer is enabled by default. When the dialer is enabled or disabled, a warning message appears. **Warning:** The dialer cannot report any event to the monitoring station if it is disabled.
------WARNING----- Dialer Disabled!!!		

10.11 8. Test Dialer (Command-Menu)

-Dialer Test-
1. L#1 Manual test
2. L#2 Manual test
3. Reset Dialer

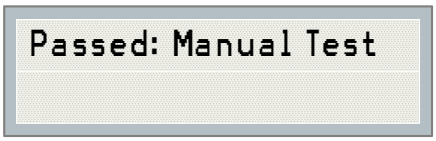
L#1 Manual test	Press Enter to test Line #1. Press Cancel to exit this menu. For a description of test messages, see *Dialer Test Messages* on the following page.
L#2 Manual test	Press Enter to test Line #2. Press Cancel to exit this menu. For a description of test messages, see *Dialer Test Messages* on the following page.

3. Reset Dialer	This feature flushes all reportable events from the buffer. Press Enter to reset the dialer. Press Cancel to exit this menu.

10.11.1 Dialer Test Messages

The following messages will display during the test processes of Lines #1 and #2. The messages that will appear depend on the status of the dialer and the test results that are found.

Dialer idle now	The dialer is checking the line for voltage. This message automatically displays when Manual Test is selected.
No DC Volt	No DC line voltage. The line is dead or no phone line is connected.
Waiting for Dialtone	The dialer is waiting for a dial tone.
Failed: No Dialtone	This message may indicate a noisy telephone line.
Dialing Receiver Now	The dial tone was received and telephone number dialing is in process.
No DTMF tone	This message indicates that the dialer failed to send a DTMF tone.
Waiting for Acktone	Waiting for availability of the receiver. The receiver confirms the availability by sending an ack tone.
Failed no Acktone	This message indicates that either the telephone number may be wrong or the receiver is not available.

	When sending events to the receiver, the display will toggle between this message and “Waiting for Kissoff “ for all events sent.
	The dialer is waiting for the kissoff tone. The kissoff tone indicates that the receiver has received the event reports.
	No Kissoff means receiver has not received any event reports.
	The line passed the test; everything is OK.

10.12 9. Exit (Command-Menu)

Pressing, “ENTER” after selecting “Exit“ from the menu will return the panel to normal LCD operation.

11.0 Operating the Panel

11.1 Panel Operation During Various Hazard States

The escalating hazard zone states include Idle, Alert, Alarm and Release. They are defined based on the status of Hazard Area input zone(s), correlated Abort Switch and Manual Release Switch.

11.1.1 Hazard Idle

- No correlated alarm zone active.
- Release Timer is not started.
- Manual Release Delay Timer is not started.
- Abort Switch is off.
- Manual Release Switch is off.
- Corresponding NAC circuit is off.
- Releasing circuit(s) is off.

11.1.2 Hazard Alert (or equivalently first Alarm in Cross-zoned Application)

- The panel enters the Hazard Alert state when
  - a single alarm comes in for a cross-zoned hazard. For non cross-zoned hazard area, a single alarm will put hazard into Hazard Alarm state directly.
  - the Abort Switch becomes active during Hazard Alarm state, so that the hazard area state downgrades from Hazard Alarm to Hazard Alert.
- Release Timer is not started.
- Manual Release Delay Timer is not started.
- Correlated NAC circuit(s) turns on at alert rate.

11.1.3 Hazard Alarm (pre-discharge, or equivalently second Alarm in Cross-zoned Application)

- The panel enters the Hazard Alarm state when
  - it detects the confirming alarm for hazard area (single alarm active for the non cross-zoned system, or 2nd alarm active in the cross-zoned system), or
- Manual Release Switch is active.
- Release Timer (RT) is started when the panel enters Hazard Alarm state after by detecting the 2nd alarm in cross-zoned hazard or 1st alarm in non cross-zoned hazard.
- Manual Release Delay Timer is started when the panel enters Hazard Alarm state by detecting the correlated Manual Release Switch active.
- Releasing circuit(s) will be activated after the Release Timer or Manual Release Timer expires.
- Corresponding NAC(s) turns on at alarm rate.
- During Hazard Alarm State, when the release timer is running and the Abort Switch turns on, the hazard area state will change from Hazard Alarm to Hazard Alert. Release Timer is held and the corresponding NAC sounds the Alert rate. If the Abort Switch is released, the hazard state will go back to Hazard Alarm and the Release Timer resumes running. The value of release timer depends on Abort Delay Type. The corresponding NAC sounds Alarm rate again.

11.1.4 Hazard Release

- Panel enters Hazard Release when the Release Timer or Manual Release Timer expires. The correlated releasing circuit is activated.
- NAC code for Hazard Release state is steady.

11.2 General Panel Operation

- Activation of Manual Release Switch starts the Manual Release Delay Timer. The expiration of Manual-release Delay Timer (MDT) activates the releasing circuits consequently. Manual Release Switch overrides the Abort Switch always and Manual-release Timer (MDT) always overrides Release Timer (RT).
- When the manual release switch is active and the panel is in the Hazard Alarm (pre-discharge) state, Abort Switch cannot override the Manual Release Switch. Only the System Reset key can interrupt and reset the panel and hazard area.
- System Reset will reset all circuits, including releasing circuits.
- The supervisory circuit can be optionally indicated on NAC-2 circuit. The NAC code of supervisory circuit should be different from those of Hazard Alert or Hazard Alarm. By default, when the NAC code for Hazard Alert is Temporal, the NAC code for supervisory circuit is 20 BPM or verse visa. This configuration change is automatically done by the panel. If NAC code for alert is chosen other than 20 BPM and Temporal, Supervisory NAC code will remain unchanged during the configuration.
- In some pre-programmed modes, the Alert Rate and the Alarm Rate are configured the same. So the action of Abort Switch does not change the NAC rate.
- AB/MR is the combination of Manual Release Switch and Abort Switch in the Agent Release panel. Short condition means Manual Release active. Current Limit means Abort Switch active.
- To avoid the conflict of different NAC code on the same circuit, the priority of signals are defined as, Water-flow alarm has the highest priority, then hazard cadence. The supervisory signal has the lowest priority.
- Soak Timer sets the time period how long the releasing circuits should be active. Upon the expiration of soak timer, the releasing circuits will be shut off. Setting of 0 second means the releasing circuits will be turned on without timer running. They will be shut off upon system reset.
- Abort function is not applicable in pre-action and deluge application.

12.0 Pre-Programmed Modes

12.1 Mode 1: Agent Release, Single Hazard, Cross-zoned, Combined Release

			Detection Zones						Phantom Zones		Release Timers	
			Z1	Z2	Z3	Z4	Z5	Z6	Zp1	Zp2	RT1 Exp	RT2 Exp
			Alm	Alm	WF	Sup	AB	MR	Z1+Z2	Z3+Z4		
Out1	Signal	Steady	X	X	X			X				
Out2	Signal	Escalating			X	(X)		X	X			
Out3	Rel.	Releasing						X			X	
Out4	Rel.	Releasing						X			X	
RLS TMR 1 Started									X			
RLS Tmr 1 Interrupted							X					
RLS Tmr 1 Cancelled								X				
RLS Tmr 2 Started												
RLS Tmr 2 Interrupted												
RLS Tmr 2 Cancelled												

12.1.1 Zone Configuration

- Detection Zone -1: Alarm (Hazard Area1, Cross-zoned)
- Detection Zone -2: Alarm (Hazard Area1, Cross-zoned)
- Detection Zone -3: Alarm (Pressure Switch or Water-flow)
- Detection Zone -4: Supervisory (Non-latching by default)
- Detection Zone -5: Abort Switch
- Detection Zone -6: Manual Release Switch
- NAC-1: Signal, will be on steady if there is any alarm zone or manual release switch active.
- NAC-2: Signal, indicates the cadence of hazard area 1 state or supervisory circuit (optional).
- RAC-1: Releasing Circuit (Hazard Area 1)
- RAC-2: Releasing Circuit (Hazard Area 1)

12.1.2 Hazard Configuration

- Default Release Timer Value: 60 seconds
- Default Manual Release Delay: 0 seconds.
- Default Abort Delay Type: Standard UL.
- Default Soak Timer Value: 0 seconds

12.1.3 NAC Configuration

- Default Escalating NAC code of Hazard Area State:
  - Hazard Idle: Off
  - Hazard Alert: Temporal

- Hazard Alarm: 120 BPM
- Hazard Release: Steady

- Default NAC code of Supervisory is 20 BPM.

12.1.4 How the Panel Works in Mode 1

- Activation of either Z-1or Z-2 turns NAC-1 on steady. Hazard Area 1 state changes from Idle into Alert. NAC-2 turns on at Temporal.
- Activations of both Z-1 and Z-2 change the Hazard Area1 state from Alert into Alarm. NAC-1 turns on steady. NAC-2 turns on at 120BPM. Release timer-1 (RT-1) is started.
- Expiration of Release Timer-1 change Hazard Area 1 state to Release. Both RAC-1 and RAC-2 turn on. NAC-2 sounds steady.
- Activation of Z-6 in any situation changes Hazard Area 1 state into Alarm. NAC-1 turns on steady, NAC-2 turns on at 120BPM. The manual release delay timer 1 (MDT-1) is started. Upon the expiration of MDT-1, Hazard Area 1 state changes to Release. RAC-1 and RAC-2 are activated. NAC-1 and NAC-2 turns on steady.
- When Hazard Area 1 state is in Alarm, if Z-5 is pressed, Release Timer-1 is held and NAC-2 rate changes from 120BPM to Temporal. After releasing of Z-5, Release Timer-1 resumes running and NAC-2 goes back to 120BPM. Release Timer -1 value depends on Abort Delay Type.
- Activation of Z-3 turns both NAC-1 and NAC-2 on steady.
- Activation of Z-4 can be indicated on NAC-2 at 20BPM, if enabled.

12.2 Mode 2: Agent Release, Single Hazard, Not Cross-zoned, Combined Release

			Detection Zones						Phantom Zones		Release Timers	
			Z1	Z2	Z3	Z4	Z5	Z6	Zp1	Zp2	RT1 Exp	RT2 Exp
			Alm	Alm	WF	Sup	AB	MR	Z1+Z2	Z3+Z4		
Out1	Signal	Steady	X	X	X			X				
Out2	Signal	Escalating			X	(X)		X				
Out3	Rel.	Releasing						X			X	
Out4	Rel.	Releasing						X			X	
RLS TMR 1 Started			X	X								
RLS Tmr 1 Interrupted							X					
RLS Tmr 1 Cancelled								X				
RLS Tmr 2 Started												
RLS Tmr 2 Interrupted												
RLS Tmr 2 Cancelled												

12.2.1 Zone Configuration

- Detection Zone -1: Alarm (Hazard Area 1, not cross-zoned)
- Detection Zone -2: Alarm (Hazard Area 1, not cross-zoned)
- Detection Zone -3: Alarm (Water-flow or pressure switch)
- Detection Zone -4: Supervisory (default non-latching)
- Detection Zone -5: Abort Switch
- Detection Zone -6: Manual Release
- NAC-1: Signal, will be on steady if there is any alarm zone or manual release switch active.
- NAC-2: Signal, indicates the cadence of hazard area 1 state or supervisory circuit (optional).
- RAC-1: Releasing Circuit (Hazard Area 1)
- RAC-2: Releasing Circuit (Hazard Area 1)

12.2.2 Hazard Configuration

- Default Release Timer Value: 60 seconds
- Default Manual Release Delay: 0 seconds.
- Default Abort Delay Type: Standard UL.
- Default Soak Timer Value: 0 seconds

12.2.3 NAC Configuration

- Default Escalating NAC code of Hazard Area State:
  - Hazard Idle: Off
  - Hazard Alert: Temporal
  - Hazard Alarm: Temporal
  - Hazard Release: Steady
- Default NAC code of Supervisory Signal is 20 BPM.

12.2.4 How the Panel Works in Mode 2

- Activation of either Z-1 or Z-2 turns NAC-1 on steady.
- Activation of either Z-1 or Z-2 changes the Hazard Area 1 state from Idle into Alarm directly. NAC-1 turns on steady. NAC-2 turns on Temporal. Release Timer-1 is started.
- Expiration of Release Timer-1 activates both RAC-1 and RAC-2. NAC-1 and NAC-2 turn on steady.
- Activation of Z-6 starts Manual-release Timer 1 (MDT-1) in any situation. NAC-1 turns on steady. NAC-2 turns on Temporal. Upon the expiration of MDT-1, RAC-1 and RAC-2 turn on.
- During Hazard Alarm state, if Z-5 is pressed, Release Timer-1 is held. After releasing of Z-5, Release Timer-1 resumes running and Release Timer value depends on Abort Delay Type.
- Activation of Z-3 turns both NAC-1 and NAC-2 on steady.
- Activation of Z-4 can be indicated on NAC-2 at 20BPM, if enabled.

12.3 Mode 3: Agent Release, Dual Hazard, Cross-zoned, Split Release

			Detection Zones						Phantom Zones		Release Timers	
			Z1	Z2	Z3	Z4	Z5	Z6	Zp1	Zp2	RT1 Exp	RT2 Exp
			Alm	Alm	Alm	Alm	AB/MR	AB/MR	Z1+Z2	Z3+Z4		
Out1	Signal	Steady					X		X			
Out2	Signal	Escalating						X		X		
Out3	Rel.	Releasing					X				X	
Out4	Rel.	Releasing						X				X
RLS TMR 1 Started									X			
RLS Tmr 1 Interrupted							X					
RLS Tmr 1 Cancelled							X					
RLS Tmr 2 Started										X		
RLS Tmr 2 Interrupted								X				
RLS Tmr 2 Cancelled								X				

12.3.1 Zone Configuration

- Detection Zone -1: Alarm (Hazard Area 1, Cross-zoned)
- Detection Zone -2: Alarm (Hazard Area 1, Cross-zoned)
- Detection Zone -3: Alarm (Hazard Area 2, Cross-zoned)
- Detection Zone -4: Alarm (Hazard Area 2, Cross-zoned)
- Detection Zone -5: Abort/Manual Release Combination (Hazard Area 1)
- Detection Zone -6: Abort/Manual Release Combination (Hazard Area 2)
- NAC -1: Escalating Signal, indicates Hazard Area 1 state
- NAC -2: Escalating Signal, indicates Hazard Area 2 state
- RAC -1: Releasing Circuit (Hazard Area 1)
- RAC -2: Releasing Circuit (Hazard Area 2)

12.3.2 Hazard Configuration

- Default Release Timer Value: 60 seconds
- Default Manual Release Delay: 0 seconds.
- Default Abort Delay Type: Standard UL.
- Default Soak Timer Value: 0 seconds

12.3.3 NAC Configuration

Default Escalating NAC code of Hazard Area State:

- Hazard Idle: Off
- Hazard Alert: Temporal
- Hazard Alarm: 120 BPM
- Hazard Release: Steady

12.3.4 How the Panel Works in Mode 3

- Activation of either Z-1 or Z-2 changes Hazard Area1 state from Idle into Alert. NAC-1 turns on at Temporal.
- Activations of both Z-1 and Z-2 change Hazard Area1 state from Alert into Alarm. NAC-1 turns on at 120BPM. Release timer-1 is started.
- Upon the expiration of Release Timer-1, RAC-1 is activated. NAC-1 turns on steady.
- Short on Z-5 indicates Manual Release Switch active. Manual Release Delay Timer 1 (MDT-1) is started. NAC-1 turns on at 120 BPM while this timer is running. Upon the expiration of MDT-1, NAC-1 turns on steady and RAC-1 is activated.
- A current limit on Z-5 means Abort Switch active. Hazard Area 1 state changes from Alarm to Alert. Release Timer is held and NAC-1 changes from 120BPM to Temporal.
- Removal of the current limit on Z-5 means that Abort Switch is released. Hazard Area 1 state changes from Alert to Alarm. Release Timer -1 resumes running and NAC-1 goes back to 120BPM. Release Timer-1 value depends on Abort Delay Type.
- Activation of either Z-3 or Z-4 changes Hazard Area 2 state from Idle into Alert. NAC-2 turns on at Temporal.
- Activations of both Z-3 and Z-4 turn the Hazard Area 2 state from Alert into Alarm. NAC-2 turns on at 120BPM. Release timer-2 is started.
- Upon the expiration of Release Timer-2, RAC-2 is activated. NAC-2 turns on steady.
- Short on Z-6 indicates Manual Release Switch active. Manual Release Delay Timer -2(MDT-2) is started. NAC-2 turns on at 120 BPM while this timer is running. Upon the expiration of MDT-2, NAC-2 turns on steady and RAC-2 is activated
- A current limit on Z-6 means Abort Switch active. Hazard Area 1 state changes from Alarm to Alert. Release Timer -2 is held and NAC-2 changes from 120BPM to Temporal.
- Removal of the current limit on Z-6 means Abort Switch is released. Hazard Area 1 state changes from Alert to Alarm. Release Timer -2 resumes running and NAC-2 goes back to 120BPM. Release Timer-2 value depends on Abort Delay Type.

12.4 Mode 4: Agent Release, Dual Hazard, Not Cross-zoned, Split Release

			Detection Zones						Phantom Zones		Release Timers	
			Z1	Z2	Z3	Z4	Z5	Z6	Zp1	Zp2	RT1 Exp	RT2 Exp
			Alm	Alm	Alm	Alm	AB/MR	AB/MR	Z1+Z2	Z3+Z4		
Out1	Signal	Steady	X	X			X					
Out2	Signal	Escalating			X	X		X				
Out3	Rel.	Releasing					X				X	
Out4	Rel.	Releasing						X				X
RLS TMR 1 Started			X	X								
RLS Tmr 1 Interrupted							X					
RLS Tmr 1 Cancelled							X					
RLS Tmr 2 Started					X	X						
RLS Tmr 2 Interrupted								X				
RLS Tmr 2 Cancelled								X				

12.4.1 Zone Configuration

- Detection Zone -1: Alarm (Hazard Area 1, not cross-zoned)
- Detection Zone -2: Alarm (Hazard Area 1, not cross-zoned)
- Detection Zone -3: Alarm (Hazard Area 2, not cross-zoned)
- Detection Zone -4: Alarm (Hazard Area 2, not cross-zoned)
- Detection Zone -5: Abort/Manual Release Combination (hazard 1)
- Detection Zone -6: Abort/Manual Release Combination (hazard 2)
- NAC -1: Escalating Signal, indicates Hazard Area 1 state
- NAC -2: Escalating Signal, indicates Hazard Area 2 state
- RAC -1: Releasing Circuit (Hazard Area 1)
- RAC -2: Releasing Circuit (Hazard Area 2)

12.4.2 Hazard Configuration

- Default Release Timer Value: 60 seconds
- Default Manual Release Delay: 0 seconds.
- Default Abort Delay Type: Standard UL.
- Default Soak Timer Value: 0 seconds

12.4.3 NAC Configuration

Default Escalating NAC code of Hazard Area State:

- Hazard Idle: Off
- Hazard Alarm: Temporal
- Hazard Release: Steady

12.4.4 How the Panel Works in Mode 4

- Activation of either Z-1 or Z-2 changes Hazard Area1 state from Idle to Alarm. NAC-1 turns on at Temporal. Release Timer-1 is started.
- Upon expiration of Release Timer-1. RAC-1 is activated. NAC-1 turns on Steady.
- A current limit on Z-5 means Abort Switch active. Release Timer-1 is held. NAC-1 turns on at Temporal. Removal of the current limit on Z-5 means that Abort Switch is released. Release Timer -1 resumes. Release Timer value depends on Abort Delay Type.
- Short on Z-5 indicates Manual Release active. Manual Release Delay Timer - 1 (MDT-1) is started. NAC-1 turns on at Temporal. Upon the expiration of MDT-1, NAC-1 turns on steady and RAC-1 is activated.
- Activation of either Z-3 or Z-4 turns the Hazard Area 2 state from Idle into Alarm. NAC-2 turns on at Temporal. Release timer-2 is started.
- Upon expiration of Release Timer-2, RAC-2 is activated. NAC-2 turns on steady.
- A current limit on Z-6 means Abort Switch active. Release Timer -2 is held. Removal of the current limit on Z-6, means releasing Abort Switch. Release Timer -2 resumes running. Release Timer 2 value depends on Abort Delay Type.
- Short on Z-6 indicates Manual Release active and Manual Release Delay Timer - 2(MDT-2) is started. NAC-2 turns on at Temporal. Upon the expiration of MDT-2, NAC-2 turns on steady and RAC-2 is activated.

12.5 Mode 5: Pre-action/Deluge, Single Hazard, Cross-zoned, Combined Release

			Detection Zones						Phantom Zones	
			Z1	Z2	Z3	Z4	Z5	Z6	Zp1	RT1 Exp
			Alm	Alm	Alm	Alm	Supv	WF	Z1+Z2+Z3+Z4	
Out1	Signal	Steady	X	X	X	X		X		
Out2	Signal	Escalating					(X)	X		
Out3	Rel.	Releasing								X
Out4	Rel.	Releasing								X
RLS TMR 1 Started									X	
RLS Tmr 1 Interrupted										
RLS Tmr 1 Cancelled										

12.5.1 Zone Configuration

- Detection Zone -1: Alarm (Hazard Area 1, cross-zoned)
- Detection Zone -2: Alarm (Hazard Area 1, cross-zoned)
- Detection Zone -3: Alarm (Hazard Area 1, cross-zoned)
- Detection Zone -4: Alarm (Hazard Area 1, cross-zoned)
- Detection Zone -5: Supervisory
- Detection Zone -6: Water-flow Alarm.
- NAC -1: Signal, will be activated if there is any alarm zone active.
- NAC -2: Escalating Signal, indicates Hazard Area 1 status, Supervisory Optional.
- RAC -1: Releasing Circuit (Hazard Area 1)
- RAC -2: Releasing Circuit (Hazard Area 1)

12.5.2 Hazard Configuration

- Default Release Timer Value: 0 seconds
- Default Manual Release Delay: 0 seconds (not used)
- Default Abort Delay Type: Standard UL (not used)
- Default Soak Timer Value: 0 seconds (continuous)

12.5.3 NAC Configuration

- Default Escalating NAC code of Hazard Area State:
  - Hazard Idle: Off
  - Hazard Alert: Temporal
  - Hazard Alarm: 120 BPM
  - Hazard Release: Steady
- Default NAC code of Supervisory is 20 BPM.

12.5.4 How the Panel Works in Mode 5

- Activation of Z-1, Z-2, Z-3 or Z-4 changes Hazard Area 1 state from Idle to Alert. NAC-1 turns on steady. NAC-2 sounds Temporal.

- Activations of any two of Z-1, Z-2, Z-3 and Z-4 change Hazard Area 1 state into Alarm. Release Timer-1 is started. NAC-2 turns on at 120 BPM. Upon the expiration of Release Timer 1, both RAC-1 and RAC-2 turn on. NAC-1 and NAC-2 turn on Steady
- Activation of Z-6 turns on both NAC-1 and NAC-2 steady.
- Activation of Z-5 is indicated on NAC-2 at 20 BPM, if configured.

12.6 Mode 6: Pre-action/Deluge, Single Hazard, Not Cross-zoned, Combined Release

			Detection Zones						Phantom Zones	
			Z1	Z2	Z3	Z4	Z5	Z6	Zp1	RT1 Exp
			Alm	Alm	Alm	Alm	Supv	WF	Z1+Z2+Z3+Z4	
Out1	Signal	Steady	X	X	X	X		X		
Out2	Signal	Escalating					(X)			
Out3	Rel.	Releasing								X
Out4	Rel.	Releasing								X
RLS TMR 1 Started			X	X	X	X				
RLS Tmr 1 Interrupted										
RLS Tmr 1 Cancelled										

12.6.1 Zone Configuration

- Detection Zone -1: Alarm (Hazard Area 1, not cross-zoned)
- Detection Zone -2: Alarm (Hazard Area 1, not cross-zoned)
- Detection Zone -3: Alarm (Hazard Area 1, not cross-zoned)
- Detection Zone -4: Alarm (Hazard Area 1, not cross-zoned)
- Detection Zone -5: Supervisory
- Detection Zone -6: Water-flow.
- NAC -1: Signal, steady on any alarm.
- NAC -2: Supervisory optional.
- RAC -1: Releasing Circuit (Hazard Area 1)
- RAC -2: Releasing Circuit (Hazard Area 1)

12.6.2 Hazard Configuration

- Default Release Timer Value: 0 seconds
- Default Manual Release Delay: 0 seconds (not used)
- Default Abort Delay Type: Standard UL (not used)
- Default Soak Timer Value: 0 seconds (continuous)

12.6.3 NAC Configuration

- Default Escalating NAC code of Hazard Area State:
  - Hazard Idle: Off
  - Hazard Alert: Temporal
  - Hazard Alarm: Temporal
  - Hazard Release: Steady
- Default NAC code of Supervisory is 20 BPM.

12.6.4 How the Panel Works in Mode 6

- Activation of any one among Z-1, Z-2, Z-3 and Z-4 changes Hazard Area 1 state into Alarm. Release Timer-1 is started. NAC-1 turns on at Temporal. Upon the expiration of Release Timer-1, NAC-1 turns on steady. RAC-1 and RAC-2 are activated.
- Activation of Z-5 can be indicated on NAC-2 at 20 BPM, if configured.
- Activation of Z-6 turns NAC-1 steady.

12.7 Mode 7: Pre-action/Deluge, Dual Hazard, Cross-zoned, Split Release

			Detection Zones						Phantom Zones		Release Timers	
			Z1	Z2	Z3	Z4	Z5	Z6	Zp1	Zp2	RT1 Exp	RT2 Exp
			Alm	Alm	Alm	Alm	Supv	WF	Z1+Z2	Z3+Z4		
Out1	Signal	Steady						X	X			
Out2	Signal	Escalating						X		X		
Out3	Rel.	Releasing									X	
Out4	Rel.	Releasing										X
RLS TMR 1 Started									X			
RLS Tmr 1 Interrupted												
RLS Tmr 1 Cancelled												
RLS Tmr 2 Started										X		
RLS Tmr 2 Interrupted												
RLS Tmr 2 Cancelled												

12.7.1 Zone Configuration

- Detection Zone -1: Alarm (Hazard Area 1, cross-zoned)
- Detection Zone -2: Alarm (Hazard Area 1, cross-zoned)
- Detection Zone -3: Alarm (Hazard Area 2, cross-zoned)
- Detection Zone -4: Alarm (Hazard Area 2, cross-zoned)
- Detection Zone -5: Supervisory
- Detection Zone -6: Water-flow.
- NAC -1: Escalating Signal, indicates Hazard Area 1 status
- NAC -2: Escalating Signal, indicates Hazard Area 2 status
- RAC -1: Releasing Circuit (Hazard Area 1)
- RAC -2: Releasing Circuit (Hazard Area 2)

12.7.2 Hazard Configuration

- Default Release Timer Value: 0 seconds
- Default Manual Release Delay: 0 seconds (not used)
- Default Abort Delay Type: Standard UL (not used)
- Default Soak Timer Value: 0 seconds (continuous)

12.7.3 NAC Configuration

- Default Escalating NAC code of Hazard Area State:
  - Hazard Idle: Off
  - Hazard Alert: Temporal
  - Hazard Alarm: 120BPM
  - Hazard Release: Steady
- Default NAC code of Supervisory is 20 BPM.

12.7.4 How the Panel Works in Mode 7

- Activation of either Z-1 or Z-2 changes Hazard Area 1 state into Alert. NAC-1 turns on at Temporal.
- Activations of both Z-1 and Z-2 change Hazard Area 1 state into Alarm. Release Timer-1 is started. Upon the expiration of Release Timer-1, RAC-1 is active. NAC-1 turns on steady.
- Activation of either Z-3 or Z-4 changes Hazard Area 2 state into Alert. NAC-2 turns on at Temporal.
- Activations of both Z-3 and Z-4 changes Hazard Area 2 state into Alarm. Release Timer 2 is started. Upon the expiration of Release Timer 2, RAC-2 is active. NAC-2 turns on steady.
- Activation of Z-6 turns both NAC-1 and NAC-2 steady.
- Activation of Z-5 can be indicated on NAC-2, if enabled.

12.8 Mode 8: Pre-action/Deluge, Dual Hazard, Not Cross-zoned, Split Release

			Detection Zones						Phantom Zones		Release Timers	
			Z1	Z2	Z3	Z4	Z5	Z6	Zp1	Zp2	RT1 Exp	RT2 Exp
			Alm	Alm	Alm	Alm	Supv	WF	Z1+Z2	Z3+Z4		
Out1	Signal	Steady	X	X				X				
Out2	Signal	Escalating			X	X		X				
Out3	Rel.	Releasing									X	
Out4	Rel.	Releasing										X
RLS TMR 1 Started			X	X								
RLS Tmr 1 Interrupted												
RLS Tmr 1 Cancelled												
RLS Tmr 2 Started					X	X						
RLS Tmr 2 Interrupted												
RLS Tmr 2 Cancelled												

12.8.1 Zone Configuration

- Detection Zone -1: Alarm (Hazard Area 1, not cross-zoned)
- Detection Zone -2: Alarm (Hazard Area 1, not cross-zoned)
- Detection Zone -3: Alarm (Hazard Area 2, not cross-zoned)
- Detection Zone -4: Alarm (Hazard Area 2, not cross-zoned)
- Detection Zone -5: Supervisory
- Detection Zone -6: Water-flow.
- NAC -1: Escalating Signal, indicates Hazard Area 1 status
- NAC -2: Escalating Signal, indicates Hazard Area 2 status
- RAC 1: Releasing Circuit (Hazard Area 1)
- RAC -2: Releasing Circuit (Hazard Area 2)

12.8.2 Hazard Configuration

- Default Release Timer Value: 0 seconds
- Default Manual Release Delay: 0 seconds (not used)
- Default Abort Delay Type: Standard UL (not used)
- Default Soak Timer Value: 0 seconds (continuous)

12.8.3 NAC Configuration

- Default Escalating NAC code of Hazard Area State:
  - Hazard Idle: Off
  - Hazard Alert: Temporal
  - Hazard Alarm: Temporal
  - Hazard Release: Steady
- Default NAC code of Supervisory is 20 BPM.

12.8.4 How the Panel Works in Mode 8

- Activation of either Z-1 or Z-2 changes Hazard Area 1 state into Alarm. Release Timer 1 is started. NAC-1 turns on at Temporal. Upon the expiration of Release Timer 1, RAC-1 is active. NAC-1 turns on steady.
- Activation of either Z-3 or Z-4 changes Hazard Area 2 state into Alarm. Release Timer 2 is started. NAC-2 turns on at Temporal. Upon expiration of Release Timer 2, RAC-2 is active. NAC-2 turns on steady.
- Activation of Z-6 turns both NAC-1 and NAC-2 on steady.
- Activation of Z-5 can be indicated on NAC-2, if enabled.

12.9 Mode 9: Agent Release, Single Hazard, Cross-zoned, NYC abort

			Detection Zones						Phantom Zones		Release Timers	
			Z1	Z2	Z3	Z4	Z5	Z6	Zp1	Zp2	RT1 Exp	RT2 Exp
			Alm	Alm	WF	Supv	AB	MR	Z1+Z2	Z3+Z4		
Out1	Signal	Steady							X			
Out2	Signal	Escalating			X	(X)		X	X			
Out3	Rel.	Releasing						X			X	
Out4	Strobe	Steady			X			X	X		X	
RLS TMR 1 Started									X			
RLS Tmr 1 Interrupted							X					
RLS Tmr 1 Cancelled								X				
RLS Tmr 2 Started												
RLS Tmr 2 Interrupted												
RLS Tmr 2 Cancelled												

12.9.1 Zone Configuration

- Detection Zone -1: Alarm (Hazard Area 1, cross-zoned)
- Detection Zone -2: Alarm (Hazard Area 1, cross-zoned)
- Detection Zone -3: Alarm (Pressure Switch or Water-flow)
- Detection Zone -4: Supervisory
- Detection Zone -5: Abort Switch
- Detection Zone -6: Manual Release
- NAC-1: Escalating Signal, indicate Hazard Area 1 status.
- NAC-2: Escalating Signal, indicate Hazard Area 1 status, Supervisory Optional.
- RAC-1: Releasing Circuit (Hazard Area 1)
- NAC-3: Silenceable Strobe.

12.9.2 Hazard Configuration

- Default Release Timer Value: 60 seconds
- Default Manual Release Delay: 0 seconds
- Default Abort Delay Type: NYC
- Default Soak Timer Value: 0 seconds (continuous)

12.9.3 NAC Configuration

- Default Escalating NAC code of Hazard Area State:
  - Hazard Idle: Off
  - Hazard Alert: Steady
  - Hazard Alarm: 120BPM
  - Hazard Release: Steady
- Default NAC code of supervisory is 20 BPM

12.9.4 How the Panel Works in Mode 9

- The activation of either Z-1 or Z-2 turns NAC-1 on steady.
- The activations of both Z-1 and Z-2 turn NAC-1 off, turn NAC-2 on at 120BPM, and turn NAC-3 on steady. Hazard Area 1 state changes to Alarm. Release Timer-1 is started. Upon the expiration of Release Timer 1, RAC-1 is active, NAC-1 and NAC-2 turn on steady, and NAC-3 remains on steady.
- If Abort Switch Z-5 is active when Release Timer-1 is running, Hazard Area 1 state changes to Alert. NAC-2 turns off and NAC-1 turns on Steady. Release Timer-1 is held.
- If Abort Switch Z-5 is released, NAC-1 turns off and NAC-2 turns on 120BPM. Release Timer resumes running. Release Timer-1's value depends on Abort Delay Type.
- Activation of Z-6 starts Manual Release Timer 1 (MDT-1). Upon the expiration of MDT-1, NAC-2 and NAC-3 turn on steady. RAC-1 is active.
- Activation of Z-4 is indicated at 20BPM on NAC-2, if configured.

12.10 Mode 10: Agent Release, Single Hazard, Not Cross-zoned, Combined Release

			Detection Zones						Phantom Zones		Release Timers	
			Z1	Z2	Z3	Z4	Z5	Z6	Zp1	Zp2	RT1 Exp	RT2 Exp
			Alm	Alm	WF	Supv	AB	MR	Z1+Z2	Z3+Z4		
Out1	Signal	Steady	X	X	X			X				
Out2	Signal	Escalating			X	(X)		X	X			
Out3	Rel.	Releasing						X			X	
Out4	Rel.	Releasing						X			X	
RLS TMR 1 Started									X			
RLS Tmr 1 Interrupted							X					
RLS Tmr 1 Cancelled								X				
RLS Tmr 2 Started												
RLS Tmr 2 Interrupted												
RLS Tmr 2 Cancelled												

12.10.1 Zone Configuration

- Detection Zone -1: Alarm (Hazard Area1, not cross-zoned)
- Detection Zone -2: Alarm (Hazard Area1, not cross-zoned)
- Detection Zone -3: Alarm (Pressure Switch or Water-flow)
- Detection Zone -4: Supervisory
- Detection Zone -5: Abort Switch
- Detection Zone -6: Manual Release
- NAC -1: Signal, will be activated steady when there is any alarm zone active.
- NAC -2: Signal, indicate the Hazard Area1 status.
- RAC 1: Releasing Circuit
- RAC -2: Releasing Circuit

12.10.2 Hazard Configuration

- Default Release Timer Value: 60 seconds
- Default Manual Release Delay: 0 seconds.
- Default Abort Delay Type: Standard UL.
- Soak Timer Value: 0 seconds (continuous)

12.10.3 NAC Configuration

- Default Escalating NAC code of Hazard Area State:
  - Hazard Idle: Off
  - Hazard Alert: 20BPM
  - Hazard Alarm: 60BPM
  - Hazard Release: Steady
- Default NAC code of supervisory is Temporal

12.10.4 How the Panel Works in Mode 10

- Activation of either Z-1 or Z-2 turns NAC-1 on steady.
- Activation of either Z-1 or Z-2 turns NAC-2 on at 60BPM. Release Timer-1 is started.
- Expiration of Release Timer-1 activates both RAC-1 and RAC-2. NAC-1 and NAC-2 turn on steady.
- Activation of Z-6 starts Manual Release Delay Timer -1(MDT-1). Upon the expiration of MDT-1, both RAC-1 and RAC-2 are active. NAC-1 and NAC-2 turn on steady.
- If Z-5 is active, Release Timer-1 is held and NAC-2 is downgraded from 60BPM to 20 BPM.
- Releasing of Z-5 resumes Release Timer-1 and NAC-2 goes back to 60BPM. Release Timer-1's value depends on Abort Delay Type.
- Activation of Z-3 turns both NAC-1 and NAC-2 on steady.
- Activation of Z-4 can be indicated on NAC-2 at Temporal, if configured.

12.11 Mode 11: Agent Release, Single Hazard, Cross-zoned, Combined Release

			Detection Zones						Phantom Zones		Release Timers	
			Z1	Z2	Z3	Z4	Z5	Z6	Zp1	Zp2	RT1 Exp	RT2 Exp
			Alm	Alm	WF	Supv	AB	MR	Z1+Z2	Z3+Z4		
Out1	Signal	Steady							X			
Out2	Signal	Escalating			X	(X)		X	X			
Out3	Rel.	Releasing						X			X	
Out4	Rel.	Releasing						X			X	
RLS TMR 1 Started									X			
RLS Tmr 1 Interrupted							X					
RLS Tmr 1 Cancelled								X				
RLS Tmr 2 Started												
RLS Tmr 2 Interrupted												
RLS Tmr 2 Cancelled												

12.11.1 Zone Configuration

- Detection Zone -1: Alarm (Hazard Area1, cross-zoned)
- Detection Zone -2: Alarm (Hazard Area1, cross-zoned)
- Detection Zone -3: Alarm (Pressure Switch or Water-flow)
- Detection Zone -4: Supervisory (Default non-latching)
- Detection Zone -5: Abort Switch
- Detection Zone -6: Manual Release
- NAC -1: Signal, indicate the Hazard Area1 status.
- NAC -2: Signal, indicate the Hazard Area1 status.
- RAC -1: Releasing Circuit
- RAC -2: Releasing Circuit

12.11.2 Hazard Configuration

- Default Release Timer Value: 60 seconds
- Default Manual Release Delay: 0 seconds
- Default Abort Delay Type: Standard UL.
- Soak Timer Value: 0 seconds (continuous)

12.11.3 NAC Configuration

- Default Escalating NAC code of Hazard Area State:
  - Hazard Idle: Off
  - Hazard Alert: Steady
  - Hazard Alarm: 60BPM
  - Hazard Release: Steady
- Default NAC code of supervisory is 20 BPM

12.11.4 How the Panel Works in Mode 11

- The activation of either Z-1 or Z-2 turns NAC-1 on steady.
- The activations of both Z-1 and Z-2 turn NAC-1 off and turn NAC-2 on at 60BPM. Release Timer-1 is started.
- Expiration of Release Timer-1 results in the activation of RAC-1 and RAC-2. NAC-2 turns on steady.
- If Z-5 is active, when the Release Timer-1 is running, NAC-2 turns off and NAC-1 turns on Steady. The Release Timer is held.
- If Z-5 is released, NAC-1 turns off and NAC-2 turns on 60BPM. Release Timer-1 resumes running. Release Timer value depends on Abort Delay Type.
- Activation of Z-6 starts Manual Release Delay Timer-1(MDT-1). Upon the expiration of MDT-1, RAC-1 and RAC-2 are active. NAC-2 turns on steady.
- Activation of Z-3 turns NAC-2 on steady.
- Activation of Z-4 can be indicated on NAC-2 at 20BPM, if configured.

12.12 Mode 12: Pre-action/Deluge, Single Hazard, Cross Zoned, Combined Release

Attention: This mode of operation is not FM approved.

			Detection Zones						Phantom Zones	
			Z1	Z2	Z3	Z4	Z5	Z6	Zp1	RT1 Exp
			Alm	Alm	Alm	Supv	Supv	WF	Z1+Z2+Z3	
Out1	Signal	Steady	X	X	X			X		
Out2	Signal	Escalating				(X)	(X)	X	X	
Out3	Rel.	Releasing								X
Out4	Rel.	Releasing								X
RLS TMR 1 Started									X	
RLS Tmr 1 Interrupted										
RLS Tmr 1 Cancelled										

Zone Configuration

- Detection Zone -1: Alarm (Hazard Area 1, cross-zoned)
- Detection Zone -2: Alarm (Hazard Area 1, cross-zoned)
- Detection Zone -3: Alarm (Hazard Area 1, cross-zoned)
- Detection Zone -4: Supervisory
- Detection Zone -5: Supervisory
- Detection Zone -6: Water-flow Alarm.
- NAC -1: Signal, will be activated if there is any alarm zone active.
- NAC -2: Escalating Signal, indicates Hazard Area 1 status, Supervisory Optional.
- RAC -1: Releasing Circuit (Hazard Area 1)
- RAC -2: Releasing Circuit (Hazard Area 1)

12.12.1 Hazard Configuration

- Default Release Timer Value: 0 seconds
- Default Manual Release Delay: 0 seconds (not used)
- Default Abort Delay Type: Standard UL (not used)
- Default Soak Timer Value: 0 seconds (continuous)

12.12.2 NAC Configuration

- Default Escalating NAC code of Hazard Area State:
- Hazard Idle: Off
- Hazard Alert: Temporal
- Hazard Alarm: 120 BPM
- Hazard Release: Steady
- Default NAC code of Supervisory is 20 BPM.

12.12.3 How the Panel Works in Mode 12

- Activation of Z-1, Z-2 or Z-3 changes Hazard Area 1 state from Idle to Alert. NAC-1 turns on steady. NAC-2 sounds Temporal.
- Activations of any two of Z-1, Z-2 and Z-3 change Hazard Area 1 state into Alarm. Release Timer-1 is started. NAC-2 turns on at 120 BPM. Upon the expiration of Release Timer 1, both RAC-1 and RAC-2 turn on Steady. RAC-1 and RAC-2 are activated.
- Activation of Z-6 turns on both NAC-1 and NAC-2 steady.
- Activation of Z-4 or Z-5 is indicated on NAC-2 at 20 BPM, if configured.

12.13 Mode 13: Pre-action/deluge, Single Hazard, Not Cross Zoned, Combined Release

			Detection Zones						Phantom Zones	
			Z1	Z2	Z3	Z4	Z5	Z6	Zp1	RT1 Exp
			Alm	Alm	Alm	Supv	Supv	WF	Z1+Z2+Z3	
Out1	Signal	Steady	X	X	X			X		
Out2	Signal	Escalating				(X)	(X)	X	X	
Out3	Rel.	Releasing								X
Out4	Rel.	Releasing								X
RLS TMR 1 Started			X	X	X					
RLS Tmr 1 Interrupted										
RLS Tmr 1 Cancelled										

12.13.1 Zone Configuration

- Detection Zone -1: Alarm (Hazard Area 1, not cross-zoned)
- Detection Zone -2: Alarm (Hazard Area 1, not cross-zoned)
- Detection Zone -3: Alarm (Hazard Area 1, not cross-zoned)
- Detection Zone -4: Supervisory
- Detection Zone -5: Supervisory
- Detection Zone -6: Water-flow.
- NAC -1: Signal, steady on any alarm.
- NAC -2: Escalating signal, indicates Hazard Area 1 status, Supervisory Optional.
- RAC -1: Releasing Circuit (Hazard Area 1)
- RAC -2: Releasing Circuit (Hazard Area 1)

12.13.2 Hazard Configuration

- Default Release Timer Value: 0 seconds
- Default Manual Release Delay: 0 seconds (not used)
- Default Abort Delay Type: Standard UL (not used)
- Default Soak Timer Value: 0 seconds (continuous)

12.13.3 NAC Configuration

- Default Escalating NAC code of Hazard Area State:
- Hazard Idle: Off
- Hazard Alert: Temporal
- Hazard Alarm: Temporal
- Hazard Release: Steady
- Default NAC code of Supervisory is 20 BPM.

12.13.4 How the Panel Works in Mode 13

- Activation of any one among Z-1, Z-2 or Z-3 changes Hazard Area 1 state into Alarm. Release Timer-1 is started. NAC-1 turns on at Temporal. Upon the expiration of Release Timer-1, NAC-1 turns on steady. RAC-1and RAC-2 are activated.
- Activation of Z4 or Z-5 can be indicated on NAC-2 at 20 BPM, if configured.

- Activation of Z-6 turns NAC-1 and NAC-2 steady.

- For the use of the system for pre-action, deluge releasing applications.
- Acceptable, Approved solenoids for the FR-320 are listed in Appendix B.
- Secondary power supply must provide for minimum of 90 hours of standby operation followed by 10 minutes of releasing and alarm operation. See Appendix E for Power Supply and Battery Calculations.
- Minimum secondary supply voltage for this application is 21.1 VDC. In order to maintain required operating voltage at the solenoid, wiring lengths must not be as such as to exceed the maximum line resistance value of 1 Ohms at a maximum load of 1A.
- Initiating device circuits must be Class A for this application, thus necessitating use of the ICAC-306 Class A Converter Module.

12.14 Mode 14: Pre-action/deluge, Single Hazard, Not Cross Zoned, Combined Release

Attention: This mode of operation is neither FM nor UL approved.

			Detection Zones						Phantom Zones	
			Z1	Z2	Z3	Z4	Z5	Z6	Zp1	RT1 Exp
			Alm	Alm	Alm	Alm	Supv	WF	Z1+Z2+Z3	
Out1	Signal	Steady	X	X	X	X		X		
Out2	Signal	Escalating					(X)	X	X	
Out3	Rel.	Releasing								X
Out4	Rel.	Releasing								X
RLS TMR 1 Started			X	X	X	X				
RLS Tmr 1 Interrupted										
RLS Tmr 1 Cancelled										

12.14.1 Zone Configuration

- Detection Zone -1: Alarm (Hazard Area 1, not cross-zoned)
- Detection Zone -2: Alarm (Hazard Area 1, not cross-zoned)
- Detection Zone -3: Alarm (Hazard Area 1, not cross-zoned)
- Detection Zone -4: Alarm (Hazard Area 1, not cross-zoned)
- Detection Zone -5: Supervisory
- Detection Zone -6: Water-flow.
- NAC -1: Signal, steady on any alarm.
- NAC -2: Escalating Signal, indicates Hazard Area 1 status, Supervisory Optional.
- RAC -1: Releasing Circuit (Hazard Area 1)
- RAC -2: Releasing Circuit (Hazard Area 1)

12.14.2 Hazard Configuration

- Default Release Timer Value: 0 seconds
- Default Manual Release Delay: 0 seconds (not used)
- Default Abort Delay Type: Standard UL (not used)
- Default Soak Timer Value: 0 seconds (continuous)

12.14.3 NAC Configuration

- Default Escalating NAC code of Hazard Area State:
- Hazard Idle: Off
- Hazard Alert: Temporal
- Hazard Alarm: Temporal
- Hazard Release: Steady
- Default NAC code of Supervisory is 20 BPM.

12.14.4 How the Panel Works in Mode 14

- Activation of any one among Z-1, Z-2, Z-3 or Z4 changes Hazard Area 1 state into Alarm. Release Timer-1 is started. NAC-1 turns on steady. NAC-2 turns on Temporal if the release timer is non-zero. Upon the expiration of Release Timer-1, both NAC-1 and NAC-2 turns on steady. RAC-1 and RAC-2 are activated.
- Activation of Z-5 can be indicated on NAC-2 at 20 BPM, if configured.
- Activation of Z-6 turns NAC-1 and NAC-2 steady.

13.0 Appendix A: Compatible Receivers

The dialers that are built into select models of the FR-320 Series Pre-Action/Deluge Panels are compatible with the following Digital Alarm Communicator Receivers (DACR):

DACR Receiver Model	Protocols
SurGard MLR2 Multi-Line Receiver (ULC, ULI approved)	SIA-DCS and Ademco Contact ID
SurGard SLR Single-Line Receiver (ULC, ULI approved)	SIA-DCS and Ademco Contact ID
Osborne-Hoffman Quickalert! II Receiver (ULI approved)	SIA-DCS and Ademco Contact ID
Osborne-Hoffman OH-2000 Receiver (ULI Approved)	SIA-DCS and Ademco Contact ID
Silent Knight Model 9500 Receiver (ULI Approved)	SIA-DCS and Ademco Contact ID
Radionics Model D6500 Receiver (ULI Approved)	SIA-DCS and Ademco Contact ID
Radionics Model D6600 Receiver (ULI Approved)	SIA-DCS and Ademco Contact ID

14.0 Appendix B: FR-320 Series Compatible Devices

14.1 FR-320 Series Compatible UL Listed Two-Wire Smoke Detectors

Make Model / Base	Compatibility Identifier Head/ Base	Rated Standby Current (mA)	Maximum # of devices per circuit
Mircom			
MIR-525U	FDT-1	0.1	30
MIR-525TU	FDT-1	0.1	30
MIR-1400A	A-N/A	0.1	30
MIR-2400A	A/ N/A	0.1	30
Mircom Bases MSB-65B, MSB-65B-4, MSB-65B-4R			
MID-65I	MID-65I	0.045	25
MPD-65P	MPD-65P	0.045	20
MHD-65-135	MHD-65-135	0.055	25
MHD-65-200	MHD-65-200	0.055	25
Apollo			
Series 60A Bases 45681-200,-220,-232,-251			
Series 65A Bases 45681-255,-256,-257,-258			
55000-225	55000-225	0.045	25
55000-226	55000-226	0.045	25
55000-227	55000-227	0.028	25
55000-325	55000-325	0.045	20
55000-326	55000-326	0.045	20
55000-327	55000-327	0.04	20
55000-328	55000-328	N/A	30
55000-138	55000-138	0.055	25
55000-139	55000-139	0.055	25
55000-140	55000-140	0.045	25
Hochiki			
DCD-135/HSC-220R	HD-3/HB-72	0.035	12

Make Model / Base	Compatibility Identifier Head/ Base	Rated Standby Current (mA)	Maximum # of devices per circuit
DCD-135/NS6-220	HD-3/HB-3	0.035	12
DCD-190/HSC-220R	HD-3/HB-72	0.035	12
Hochiki continued			
DCD-190/NS4-220	HD-3/HB-3	0.035	12
DCD-190/NS6-220	HD-3/HB-3	0.035	12
SIJ-24/HSC-220R	HD-3/HB-72	0.04	12
SIJ-24/NS4-220	HD-3/HB-3	0.04	12
SIJ-24/NS6-220	HD-3/HB-3	0.04	12
SLR-24/HSC-220R	HD-3/HB-72	0.045	12
SLR-24/NS4-220	HD-3/HB-3	0.045	12
SLR-24/NS6-220	HD-3/HB-3	0.045	12
Sentrol-ESL			
429C / (701E, 701U, 702E, 702U)	S10A-S00	0.1	30
429CRT / (702E, 702RE, 702RU, 702U)	S11A-S00	0.1	30
429CST / (702E, 702RE, 702RU, 702U)	S11A-S00	0.1	30
429CT / (701E, 701U, 702E, 702U)	S10A-S00	0.1	30
711U / (701E, 701U, 702E, 702U)	S10A-S00	0.1	30
713-5U / (701E, 701U, 702E, 702U)	S10A-S00	0.1	30
713-6U / (701E, 701U, 702E, 702U)	S10A-S00	0.1	30
721U / (701E, 701U, 702E, 702U)	S10A-S00	0.1	30
721UT / (701E, 701U, 702E, 702U)	S10A-S00	0.1	30
722U / (701E, 701U, 702E, 702U)	S10A-S00	0.1	30
731U / (702E, 702RE, 702RU, 702U)	S11A-S00	0.1	30
732U / (702E, 702RE, 702RU, 702U)	S11A-S00	0.1	30
System Sensor			
1100	A-N/A	0.12	25
1400	A-N/A	0.1	25
2100	A-N/A	0.12	25
2400	A-N/A	0.12	25
1151/B110LP	A-A	0.12	25
1151/B116LP	A-A	0.12	25

Make Model / Base	Compatibility Identifier Head/ Base	Rated Standby Current (mA)	Maximum # of devices per circuit
1451/B401	A-A	0.12	25
1451/B401B	A-A	0.12	25
System Sensor continued			
1451/B406B	A-A	0.12	25
1451DH/DH400	A-A	0.12	25
2100T	A-N/A	0.12	25
2151/B110LP	A-A	0.12	25
2151/B116LP	A-A	0.12	25
2400TH	A-N/A	0.12	25
2451/B401	A-A	0.12	25
2451/B401B	A-A	0.12	25
2451/B406B	A-A	0.12	25
2451/DH400	A-A	0.12	25
2451TH/B401	A-A	0.12	25
2451TH/B401B	A-A	0.12	25
2451TH/B406B	A-A	0.12	25
5451/B401	A-A	0.12	25
5451/B401B	A-A	0.12	25
5451/B406B	A-A	0.12	25
System Sensor i3			
2W-B c/w base	A-A	0.1	30
2WT-B c/w base	A-A	0.1	30
Siemens			
HI121 / (DB-11/DB-11E)	HI121	0.1	20
OH121 / (DB-11/DB-11E)	OH121	0.1	20
OP121 / (DB-11/DB-11E)	OP121	0.1	20

Notes: For FR-320 Panels:

- Use 3.9K Ohm resistive EOL device with siemens detectors.
- Use active EOL part # ELRX-300 or ELRX-300R for all other two wire smoke detectors.

14.2 FR-320 Series ULC Listed Compatible Two-Wire Smoke Detectors

Make Model / Base	Maximum # of devices per circuit	Make Model / Base	Maximum # of devices per circuit
Mircom		**Hochiki continued**	
MIR-525	30	SLR-24/HSC-220	12
MIR-525T	30	SLR-24/NS4-220	12
MIR-1400A	30	SLR-24/NS6-220	12
MIR-2400A	30	**System Sensor i3**	
Apollo		C2W-BA c/w base	30
Series 60A Bases 45681-200,-220,-232,-251		C2WT-BA c/w base	30
Series 65A Bases 45681-255,-256,-257,-258		**System Sensor**	
55000-225	30	1400A	20
55000-226	30	2400A	20
55000-227	30	1451/B401B	20
55000-325	30	2451/B401B	20
55000-326	30	**Siemens**	
55000-327	30	HI121 / (DB-11/DB-11E)	20
55000-328	30	OH121 / (DB-11/DB-11E)	20
55000-138	30	OP121 / (DB-11/DB-11E)	20
55000-139	30		
55000-140	30		
Hochiki			
DCD-135/HSC-220R	12		
DCD-135/NS6-220	12		
DCD-190/HSC-220R	12		
DCD-190/NS4-220	12		
DCD-190/NS6-220	12		
SIJ-24/HSC-220R	12		
SIJ-24/NS4-220	12		
SIJ-24/NS6-220	12		

Notes: For FR-320 Panels:

- Use 3.9K Ohm resistive EOL device with siemens detectors.
- Use active EOL part # ELRX-300 or ELRX-300R for all other two wire smoke detectors.

14.3 FR-320 Series Compatible Solenoids

Manufacturer	Description
ASCO 8210 series	
T8210A107 24VDC	
R8210A107 24VDC	
8210A107 24VDC	
AMEREX	
17014	Actuator
BSCO	
510006	Actuator
Kidde Fenwal Protection Systems	
486500-01	Actuator
Parker	
73212	Valve Solenoid
Parker Skinner Valve Division Cardox 7-061-0006	
V5L 72750	Valve Solenoid
SIEMENS	
CPYEC-24	
TSP	
17842	Actuator

14.4 FR-320 Series Fire Panel Max. Number of Horn/Strobes

Manufacturer	Maximum # of Horn/Strobes
Wheelock	
NS-24MCW-FW	13
Gentex	
MRA-HS3-24	8
System Sensor	
P1224 MC	12
Mircom	
FHS-240-110	9
Faraday (Requires separate Circuit for Horn & Strobe)	
6234 Series	9

15.0 Appendix C: Reporting

15.1 Ademco Contact-ID

15.1.1 FR-320 Event Codes

Event Description	Event Family	Qualifier	Code	Group #	Contact #
Phone Line #1 trouble detected	Trouble	New event	1 351	00	000
Phone Line #2 trouble detected	Trouble	New event	1 352	00	000
Phone Line #1 trouble restored	Trouble	Restore	3 351	00	000
Phone Line #2 trouble restored	Trouble	Restore	3 352	00	000
Failure to report to an Account	Trouble	New event	1 354	Acct #	Acct #
Report to an Account successful	Trouble	Restore	3 354	Acct #	Acct #
Periodic (24 hr) Test Event (NORMAL)	Test	New event	1 602	00	000
Periodic (24 hr) Test Event (OFF NORMAL)	Test	New event	1 608	00	000
Manually initiated dialer test	Test	New event	1 601	00	000
Zone Fire Alarm	Alarm	New event	1 110	00	000
Zone Fire Alarm restored	Alarm	Restore	3 110	00	000
Zone Trouble detected	Trouble	New event	1 300	00	000
Zone Trouble restored	Trouble	Restore	3 300	00	000
Zone Supervisory condition	Supervisory	New event	1 200	00	000
Zone Supervisory restored	Supervisory	Restore	3 200	00	000
Waterflow	Alarm	New event	1 113	00	000
Waterflow restored	Alarm	Restore	3 113	00	000
Indicating Zone Trouble	Trouble	New event	1 320	00	000
Indicating Zone Trouble restored	Trouble	Restore	3 320	00	000
AC power lost	Trouble	New event	1 301	00	000
AC power restored	Trouble	Restore	3 301	00	000
Battery Low	Trouble	New event	1 302	00	000
Battery Low restored	Trouble	Restore	3 302	00	000
Ground Fault	Trouble	New event	1 310	00	000
Ground Fault restored	Trouble	Restore	3 310	00	000

15.2 Security Industries Association SIA-DCS

SIA protocol does not define indicating zone troubles, but lists it as Untyped Zone Trouble/ Restore.

15.2.1 FR-320 Event Codes

Event Description	Event Family	Qualifier	SIA Event Code	Parameter
Phone Line #1 trouble detected	Trouble	New event	LT	001
Phone Line #2 trouble detected	Trouble	New event	LT	002
Phone Line #1 trouble restored	Trouble	Restore	LR	001
Phone Line #2 trouble restored	Trouble	Restore	LR	002
Failure to report to an Account	Trouble	New event	RT	Acct #
Report to an Account successful	Trouble	Restore	YK	Acct #
Periodic (24 hr) Test Event (Normal)	Test	New event	RP	000
Periodic (24 hr) Test Event (Off-normal)	Test	New event	RY	000
Manually initiated dialer test	Test	New event	RX	000
Zone Fire Alarm	Alarm	New event	FA	000
Zone Fire Alarm restored	Alarm	Restore	FH	000
Zone Trouble detected	Trouble	New event	FT	000
Zone Trouble restored	Trouble	Restore	FJ	000
Zone Supervisory condition	Supervisory	New event	FS	000
Zone Supervisory restored	Supervisory	Restore	FR	000
Waterflow alarm	Alarm	New event	WA	000
Waterflow alarm restored	Alarm	Restore	WH	000
Indicating Zone Trouble (*)	Trouble	New event	UT	000
Indicating Zone Trouble restored (*)	Trouble	Restore	UR	000
AC power lost	Trouble	New event	AT	000
AC power restored	Trouble	Restore	AR	000
Battery Low	Trouble	New event	YT	000
Battery Low restored	Trouble	Restore	YR	000
Ground Fault	Trouble	New event	YP	000
Ground Fault restored	Trouble	Restore	YQ	000

16.0 Appendix D: Specifications

Table 7 FR-320 Series Specifications

FR-320 Series Fire Control Panel Chassis	
General	Digital Signal Processor (DSP) based design. Fully configurable using front panel LCD display with Password Access.
Indicating (NAC) Circuits	2 supervised style Y (Class B) indicating circuits, configured as strobes or audibles. Terminals are labeled **SIG 1** and **SIG 2**. Power limited / Regulated 24VDC FWR / 1.7A @ 49C per circuit
Initiating Circuits	6 supervised style B (Class B) initiating circuits, configurable. Terminals are labeled **DET**. Compatibility ID **A**. Power limited / 19VDC reg. / 3mA for detectors /110MVpp AC ripple / 45mA max (alarm short)
Releasing Circuit	Terminals are labeled **SIG 3** and **SIG 4** 21.1 VDC@ 1 A max per circuit, 1.7A max combined **Current Consumption** Standby: 183mA Alarm: 318mA
Supervised Auxiliary Power (non resettable)	Power limited / 21.1VDC regulated / 300mA max
4-wire smoke supply (resettable)	Power limited / 21.1VDC regulated / 100mA max
RS-485 Connection	For Remote Annunciators. Terminals are labelled RS485. Line impedance is 120 ohms.
Electrical ratings	**AC line voltage** 120 VAC 60Hz 1.7A /240 VAC 50 Hz 0.85 A, 10A slow blow fuse on secondary of transformer **Power Supply Rating** 6.5A AC maximum @ secondary of transformer **Max power allowed** • 5A • 1.7A (aux power unfiltered if used) • 0.5A (aux power filtered if used) • 0.3A (resettable auxiliary power if used) • 1.7A (for releasing circuits) If no auxiliaries are used the max power is 5A for the indicating and the releasing circuits
Auxiliary relays (resistive loads)	Must be connected to a listed power limited source of supply. Terminals are labelled **ALARM**, **TROUBLE**, **SUPV** and **AUX**. **Common Alarm** Form C, 1 A max, 28 VDC **Common Supv** Form C, 1 A max, 28 VDC **Common Trouble** Form C, 1 A max, 28 VDC

Table 7 FR-320 Series Specifications (Continued)

FR-320 Series Fire Control Panel Chassis		
	Aux Relay	Form C, 1 A max, 28 VDC
Unfiltered supply (full wave rectified)	Power limited / Unregulated / Special Application 1.7A Max, 21.3 VDC to 42.00 VDC Minimum Load 5mA	
Battery	**Type**	24VDC Gel Cell/Sealed lead acid – 10AH to 26AH
	Charging capability	10AH to 26AH
	Current Consumption	standby: 200 mA alarm: 350 mA
	Protection	10A on board (F1) slow blow micro fuse
Compliance	**System Model**	FR-320 Series Control Unit - Fire Alarm, for Releasing services
	System Type	Local Auxiliary (using PR-300), Remote Protected Premises Station (using PR-300 or FR-320-DR/DW). Central Station Protected Premises (using FR-320-DR/DW.) For ULC application also use PR-300 for alternate communication path.
	Type of Service	A, M, WF, SS
	Type of Signalling	Non-Coded
	Applicable Standards	NFPA 12, 12A, 12B, 12, 15, 16,70,72,2001, UL-864 Rev. 9, ULC S-524, ULC S-527-99

Table 8 FR-320 System Modules and Annunciators

FR-320 System Modules and Annunciators		
RM-306	Relay Adder Module	Must be connected to a listed power-limited source of supply.
	Contact rating	FormC/ 28VDC per contact / 1A resistive load max, zoned
	Current consumption	standby 0mA, alarm 80mA
ICAC-306	Input Class A Converter module	standby: 0mA / alarm: 0mA
OCAC-304	Output Class A Converter Module	standby: 0mA / alarm: 0mA

Table 8 FR-320 System Modules and Annunciators (Continued)

FR-320 System Modules and Annunciators		
SRM-312		Must be connected to a listed power-limited source of supply
	Smart Relay Module	***Contact rating*** FormC/ 28VDC per contact / 1A resistive load max, zoned
		Current consumption standby 30mA / alarm 140mA
	Contact rating	FormC/ 28VDC per contact / 1A resistive load max, zoned
	Current consumption	standby 30mA, alarm 140mA
RAM-208	8 Zone Remote Annunciator	Standby 35mA / alarm 90mA
PR-300	Polarity Reversal and City Tie Module	power limited / 24VDC unfiltered / 250mA max /14Ohms trip
		coil
	Polarity Reversal	power limited / 24VDC open / 12VDC at 3.5mA / 8.5mA max
		(shorted)
	Polarity Reversal Supv. Terminal	24VDC (normal) / -24VDC (supervisory) / 0V (trouble)
	Polarity Reversal Alarm Terminal	24VDC (normal) / -24VDC (alarm) / 0V (trouble)
	Current Consumption	standby 50mA / alarm 300mA (city tie in use) / alarm 70mA
		(city tie not in use)
RTI	Remote Trouble Indicator	Standby 35mA / alarm 35mA

17.0 Appendix E: Power Supply and Battery Calculations

Use the form below to determine the required secondary power supply (batteries).

IMPORTANT NOTICE

The main AC branch circuit connection for Fire Alarm Control Panel must provide a dedicated continuous power without provision of any disconnect devices. Use #12 AWG wire with 600-volt insulation and proper over-current circuit protection that complies with the local codes. Refer to *16.0 Appendix D: Specifications on page 105* for specifications.

POWER REQUIREMENTS (ALL CURRENTS ARE IN AMPERES)

Model Number	Description	Qty		Standby	Total Standby	Alarm	Total Alarm
FR-320(-R/W)	Pre-Action/Deluge and Agent Release Control Panel FIXED ELR/ACTIVE ELR		X	0.123/0.092	=	0.316/ 0.292	=
FR-320-DR/ DW	Pre-Action/Deluge and Agent Release Control Panel FIXED ELR/ACTIVE ELR with dialer		X	0.123/0.100	=	0.318/ 0.300	=
ICAC-306	Det Class A Converter Adder Module		X	0.000	=	0.000	=
OCAC-302	Sig Class A Converter Adder Module--2 Circuits		X	0.000	=	0.000	=
PR-300	Polarity Reversal and City Tie Module		X	0.050	=	0.300	=
RM-306	6 Relay Adder Module		X	0.000	=	0.080	=
SRM-312	12 Relay Smart Relay Module		X	0.030	=	0.140	=
RAM-208/216	Remote Annunciators		X	0.035	=	0.090	=
RTI-1	Remote Trouble Indicator		X	0.035	=	0.035	=
Two-Wire Smoke Detectors			X	✹ 0.00011	=	* 0.135	=
Four-Wire Smoke Detectors			X		=		=
Signal Load (bells, horns, strobes, and etc.)			X				=
Auxiliary Power Supply for Annunciators, etc.					=		=
Total currents (Add above currents)				STANDBY	(**A**)	ALARM	(**B**)

* Assume three Initiating Circuits are in alarm.
' Use **0.084** for five minutes, 0.168 for 10 minutes and 0.5 for 30 minutes of alarm as a multiplier figure.
✹ Using the Mircom MPD-65P 2-wire photoelectric smoke detector. See *14.0 Appendix B: FR-320 Series Compatible Devices on page 98* for other compatible smoke detectors.

Total Current Requirement: ALARM (**B**)_____ Amps. (Value obtained from column **B**)

Battery Capacity Requirement:

Battery (AH) = ([STANDBY (**A**) _____] x [(24,60 or 90 Hours) ___]**)** +

([ALARM (**B**) _____] x [Alarm in Hr.] _____**)** = (**C**) _____AH

Total System Current in Alarm State: Must be 5.5 amperes or less for FR-320 Series.

Battery Selection: Multiply (**C**) by 1.20 to derate battery.

18.0 Warranty & Warning Information

Warning Please Read Carefully
Note to End Users: This equipment is subject to terms and conditions of sale as follows:

Note to Installers
This warning contains vital information. As the only individual in contact with system users, it is your responsibility to bring each item in this warning to the attention of the users of this system. Failure to properly inform system end-users of the circumstances in which the system might fail may result in over-reliance upon the system. As a result, it is imperative that you properly inform each customer for whom you install the system of the possible forms of failure.

System Failures
This system has been carefully designed to be as effective as possible. There are circumstances, such as fire or other types of emergencies where it may not provide protection. Alarm systems of any type may be compromised deliberately or may fail to operate as expected for a variety of reasons. Some reasons for system failure include:

•*Inadequate Installation*
A Fire Alarm system must be installed in accordance with all the applicable codes and standards in order to provide adequate protection. An inspection and approval of the initial installation, or, after any changes to the system, must be conducted by the Local Authority Having Jurisdiction. Such inspections ensure installation has been carried out properly.

•*Power Failure*
Control units, smoke detectors and many other connected devices require an adequate power supply for proper operation. If the system or any device connected to the system operates from batteries, it is possible for the batteries to fail. Even if the batteries have not failed, they must be fully charged, in good condition and installed correctly. If a device operates only by AC power, any interruption, however brief, will render that device inoperative while it does not have power. Power interruptions of any length are often accompanied by voltage fluctuations which may damage electronic equipment such as a fire alarm system. After a power interruption has occurred, immediately conduct a complete system test to ensure that the system operates as intended.

•*Failure of Replaceable Batteries*
Systems with wireless transmitters have been designed to provide several years of battery life under normal conditions. The expected battery life is a function of the device environment, usage and type. Ambient conditions such as high humidity, high or low temperatures, or large temperature fluctuations may reduce the expected battery life. While each transmitting device has a low battery monitor which identifies when the batteries need to be replaced, this monitor may fail to operate as expected. Regular testing and maintenance will keep the system in good operating condition.

•*Compromise of Radio Frequency (Wireless) Devices*
Signals may not reach the receiver under all circumstances which could include metal objects placed on or near the radio path or deliberate jamming or other inadvertent radio signal interference.

•*System Users*
A user may not be able to operate a panic or emergency switch possibly due to permanent or temporary physical disability, inability to reach the device in time, or unfamiliarity with the correct operation. It is important that all system users be trained in the correct operation of the alarm system and that they know how to respond when the system indicates an alarm.

•*Automatic Alarm Initiating Devices*
Smoke detectors, heat detectors and other alarm initiating devices that are a part of this system may not properly detect a fire condition or signal the control panel to alert occupants of a fire condition for a number of reasons, such as: the smoke detectors or heat detector may have been improperly installed or positioned; smoke or heat may not be able to reach the

alarm initiating device, such as when the fire is in a chimney, walls or roofs, or on the other side of closed doors; and, smoke and heat detectors may not detect smoke or heat from fires on another level of the residence or building.

•*Software*
Most MGC products contain software. With respect to those products, MGC does not warranty that the operation of the software will be uninterrupted or error-free or that the software will meet any other standard of performance, or that the functions or performance of the software will meet the user's requirements. MGC shall not be liable for any delays, breakdowns, interruptions, loss, destruction, alteration or other problems in the use of a product arising our of, or caused by, the software.

Every fire is different in the amount and rate at which smoke and heat are generated. Smoke detectors cannot sense all types of fires equally well. Smoke detectors may not provide timely warning of fires caused by carelessness or safety hazards such as smoking in bed, violent explosions, escaping gas, improper storage of flammable materials, overloaded electrical circuits, children playing with matches or arson.

Even if the smoke detector or heat detector operates as intended, there may be circumstances when there is insufficient warning to allow all occupants to escape in time to avoid injury or death.

•*Alarm Notification Appliances*
Alarm Notification Appliances such as sirens, bells, horns, or strobes may not warn people or waken someone sleeping if there is an intervening wall or door. If notification appliances are located on a different level of the residence or premise, then it is less likely that the occupants will be alerted or awakened. Audible notification appliances may be interfered with by other noise sources such as stereos, radios, televisions, air conditioners or other appliances, or passing traffic. Audible notification appliances, however loud, may not be heard by a hearing-impaired person.

•*Telephone Lines*
If telephone lines are used to transmit alarms, they may be out of service or busy for certain periods of time. Also the telephone lines may be compromised by such things as criminal tampering, local construction, storms or earthquakes.

•*Insufficient Time*
There may be circumstances when the system will operate as intended, yet the occupants will not be protected from the emergency due to their inability to respond to the warnings in a timely manner. If the system is monitored, the response may not occur in time enough to protect the occupants or their belongings.

•*Component Failure*
Although every effort has been made to make this system as reliable as possible, the system may fail to function as intended due to the failure of a component.

•*Inadequate Testing*
Most problems that would prevent an alarm system from operating as intended can be discovered by regular testing and maintenance. The complete system should be tested as required by national standards and the Local Authority Having Jurisdiction and immediately after a fire, storm, earthquake, accident, or any kind of construction activity inside or outside the premises. The testing should include all sensing devices, keypads, consoles, alarm indicating devices and any other operational devices that are part of the system.

•*Security and Insurance*
Regardless of its capabilities, an alarm system is not a substitute for property or life insurance. An alarm system also is not a substitute for property owners, renters, or other occupants to act prudently to prevent or minimize the harmful effects of an emergency situation.

IMPORTANT NOTE: End-users of the system must take care to ensure that the system, batteries, telephone lines, etc. are tested and examined on a regular basis to ensure the minimization of system failure.

Limited Warranty
Mircom Technologies Ltd., MGC Systems Corp. and MGC System International Ltd. together with their subsidiaries and affiliates (collectively, MGC) warrants the original purchaser that for a period of three years from the date of shipment, proprietary manufactured product shall be free of defects in materials and workmanship, under normal use. During the warranty period, MGC shall, at its option, repair or replace any defective product upon return of the product to its factory, at no charge for labor and materials. Non-proprietary, third party or OEM product shall be warranted in accordance with the warranty period of the manufacturer. Any replacement and/or repaired parts are warranted for the remainder of the original warranty or ninety (90) days, whichever is longer. The original owner must promptly notify MGC in writing that there is defect in material or workmanship, such written notice to be received in all events prior to expiration of the warranty period.

International Warranty
The warranty for international customers is the same as for any customer within Canada and the United States, MGC shall not be responsible for any customs fees, taxes, or VAT that may be due.

Conditions to Void Warranty
This warranty applies only to defects in parts and workmanship relating to normal use. It does not cover:

•damage incurred in shipping or handling;

•damage caused by disaster such as fire, flood, wind, earthquake or lightning;

•damage due to causes beyond the control of MGC such as excessive voltage, mechanical shock or

•water damage;

•damage caused by unauthorized attachment, alterations, modifications or foreign objects;

•damage caused by peripherals (unless such peripherals were supplied by MGC);

•defects caused by failure to provide a suitable installation environment for the products;

•damage caused by use of the products for purposes other than those for which it was designed;

•damage from improper maintenance;

•damage arising out of any other abuse, mishandling or improper application of the products.

Warranty Procedure
To obtain service under this warranty, please return the item(s) in question to the point of purchase. All authorized distributors and dealers have a warranty program. Anyone returning goods to MGC must first obtain an authorization number. MGC will not accept any shipment whatsoever for which prior authorization has not been obtained. NOTE: Unless specific pre-authorization in writing is obtained from MGC management, no credits will be issued for custom fabricated products or parts or for complete fire alarm system. MGC will at its sole option, repair or replace parts under warranty. Advance replacements for such items must be purchased.

Note: MGC's liability for failure to repair the product under this warranty after a reasonable number of attempts will be limited to a replacement of the product, as the exclusive remedy for breach of warranty.

Disclaimer of Warranties
This warranty contains the entire warranty and shall be in lieu of any and all other warranties, whether expressed or implied (including all implied warranties of merchantability or fitness for a particular purpose) and of all other obligations or liabilities. MGC neither assumes nor authorizes any other person purporting to act on its behalf to modify or to change this warranty, or to assume for it any other warranty or liability concerning this product.

This disclaimer of warranties and limited warranty are governed by the laws of the province of Ontario, Canada.

Out of Warranty Repairs
MGC will at its option repair or replace out-of-warranty products which are returned to its factory according to the following conditions. Anyone returning goods to MGC must first obtain an authorization number. MGC will not accept any shipment whatsoever for which prior authorization has not been obtained.

Products which MGC determines to be repairable will be repaired and returned. A set fee which MGC has predetermined and which may be revised from time to time, will be charged for each unit repaired.

Products which MGC determines not to be repairable will be replaced by the nearest equivalent product available at that time. The current market price of the replacement product will be charged for each replacement unit.

The foregoing information is accurate as of the date of publishing and is subject to change or revision without prior notice at the sole discretion of the Company

WARNING: MGC recommends that the entire system be completely tested on a regular basis. However, despite frequent testing, and due to, but not limited to, criminal tampering or electrical disruption, it is possible for this product to fail to perform as expected.

NOTE: Under no circumstances shall MGC be liable for any special, incidental, or consequential damages based upon breach of warranty, breach of contract, negligence, strict liability, or any other legal theory. Such damages include, but are not limited to, loss of profits, loss of the product or any associated equipment, cost of capital, cost of substitute or replacement equipment, facilities or services, down time, purchaser's time, the claims of third parties, including customers, and injury to property.

MGC MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO ITS GOODS DELIVERED, NOR IS THERE ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, EXCEPT FOR THE WARRANTY CONTAINED HEREIN.

CANADA - Main Office
25 Interchange Way
Vaughan, ON L4K 5W3
Tel: (888) 660-4655
(905) 660-4655
Fax: (905) 660-4113

U.S.A
4575 Witmer Industrial Estates
Niagara Falls, NY 14305
Tel: (888) 660-4655
(905) 660-4655
Fax: (905) 660-4113

TECHNICAL SUPPORT
North America
Tel: (888) Mircom5
(888) 647-2665
International
Tel: (905) 647-2665

© Mircom 2011
Printed in Canada
Subject to change without prior notice

www.mircom.com